

September 7, 2021

11 years' cooperation with Kazakhstan in FNCA (Forum for Nuclear Cooperation in Asia)

FNCA Coordinator of Japan

Chief Executive Director of Kobe Science Museum

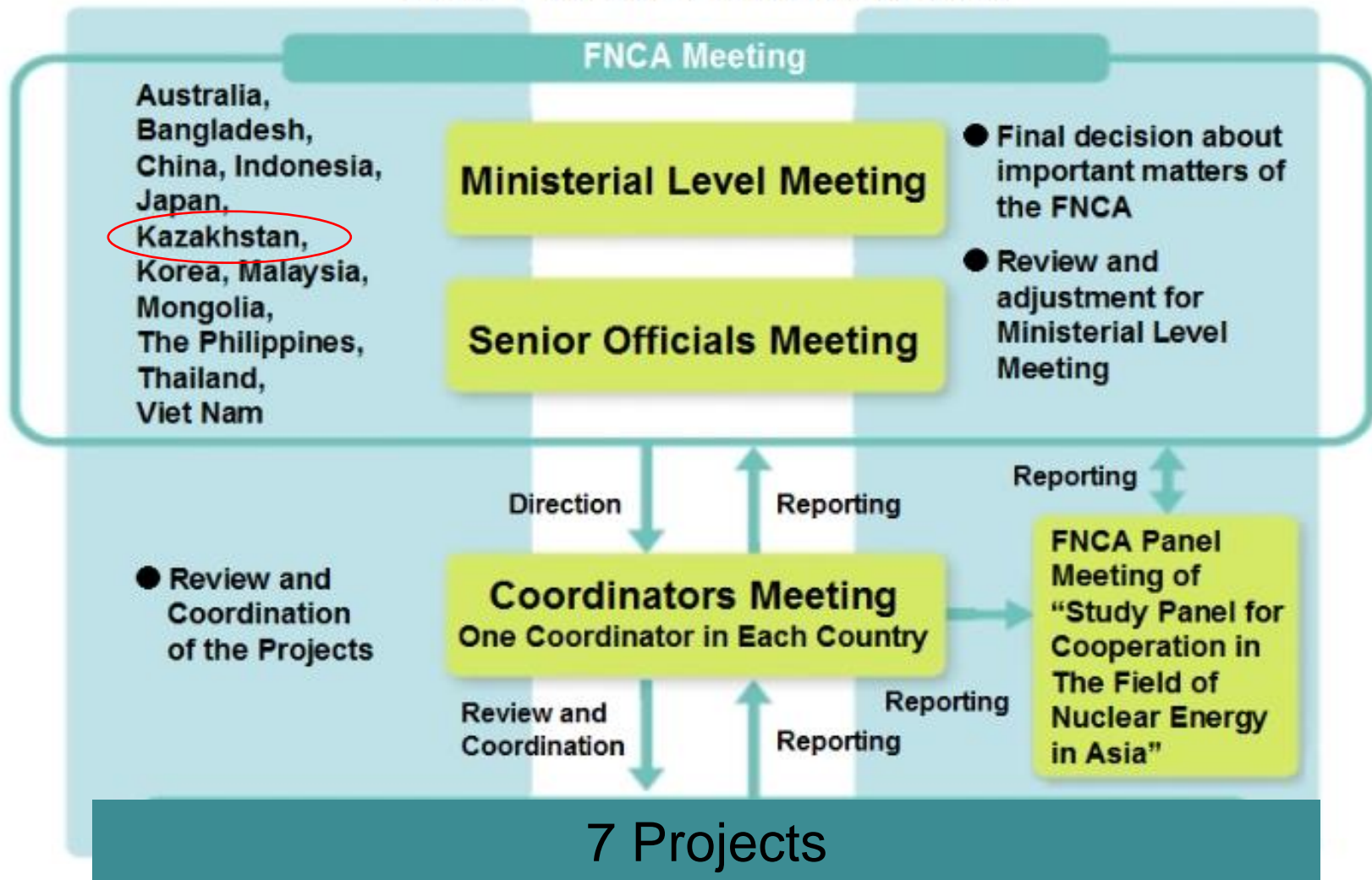
Tomoaki WADA

The IX International Conference “Semipalatinsk Test Site: Legacy and
Prospects for Scientific-Technical Potential Development”
Kurchatov

FNCA

- 1990 ICNCA (International Conference for Nuclear Cooperation in Asia) held by Atomic Energy Commission of Japan
 - Exchange of frank views by ministers in charge of development and utilization of nuclear energy on how to proceed with regional cooperation
 - Practical cooperation on specified subjects
- 2000 FNCA (Forum for Nuclear Cooperation in Asia)
 - Ministerial Level Meeting, Coordinator and Project Leader System
 - Four Fields: (1) Radiation Utilization Development (Industrial Utilization/Environmental Utilization, and Healthcare Utilization), (2) Research Reactor Utilization Development, (3) Nuclear Safety Strengthening, and (4) Nuclear Infrastructure Strengthening.

The FNCA Framework



R&D Projects on Applications of Radiation and Isotopes

- Mutation Breeding
- Radiation Processing and Polymer Modification for Agricultural, Environmental, and Medical Applications
- Radiation Oncology
- Research Reactor Utilization
- Research on Climate Change using Nuclear and Isotopic Techniques

Projects for Building Infrastructure

- Radiation Safety and Radioactive Waste Management
- Nuclear Security and Safeguards

Study Panel for Cooperation in the Field of
Nuclear Energy in Asia

FNCA Meetings and Project Workshops in Kazakhstan

Year	Month	Place	Meetings and Workshops
2012	Oct.	Almaty	Electron Accelerator Application Project Workshop
2013	Sep.	Almaty	Research Reactor Network Project Workshop
2014	Sep.	Astana	Radiation Safety and Radioactive Waste Management Project Workshop
2015	Sep.	Semey	Nuclear Security and Safeguards Project Workshop
2016	Oct.	Almaty	Radiation Safety and Radioactive Waste Management Project Workshop
2017	Oct.	Astana	18 th Ministerial Level Meeting
2018	Oct.	Kurchatov	Radiation Processing and Polymer Modification Project Workshop
2019	Sep.	Kurchatov	Research Reactor Utilization Project Workshop

The 18th Ministerial Level Meeting of FNCA (Astana, October 2017)



Project on Mutation Breeding (FNCA)

- 2002-2006 Drought tolerance of Sorghum and Soy beans
- 2003-2009 Insect resistance of Orchids
- 2004-2010 Disease resistance of Bananas
- 2007-2012 Composition or quality of Rice
- 2013~ Mutation breeding of Rice for sustainable agriculture

Using gamma-ray and/or ion beams to develop mutant varieties that are resistant to various environmental stresses, early-maturity, and low-input mutant varieties relevant to the demands of each country.

Malaysia

NMR 152 (in M5)

**Resistant to drought,
Resistant to blast,
High yield in drought
(38% higher than cont.)**

Farmer's variety

**New mutant varieties NMR 152 and NMR 151(2017)(from ion beam)
Economic effect : 90 million USD/year**

Project on Radiation Processing and Polymer Modification (FNCA)

- 2002-2005 Treatment of flue-gas
- 2006-2008 Radiation processing of natural polymers
- 2009~ R&D on plant growth promoter/elicitor and super water absorbent

To develop a plant growth promoter and elicitor by degradation of natural polymers as well as applications of radiation cross-linked hydrogel for super water absorbent, aiming for technical transfer to the end users.

- 2018~ Electron Accelerator Project and Biofertilizer Project have been merged

PGP and SWA inclusive process development

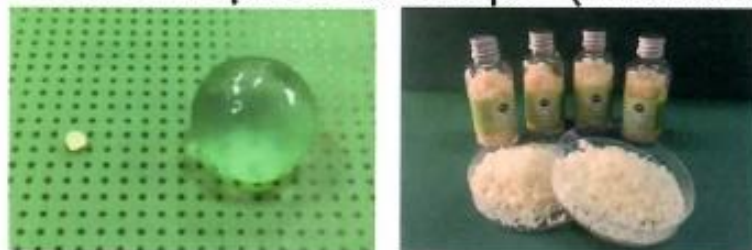
Expansion of application of carrageenan PGP for bananas, sugarcane and cacao (Philippines)



Agricultural products for realization (Kazakhstan)



A new generation of SWA beads with uniform spherical shape (Thailand)



More practical and less-energy consuming processing

Pot test for Chinese kale (Malaysia)



Current problems

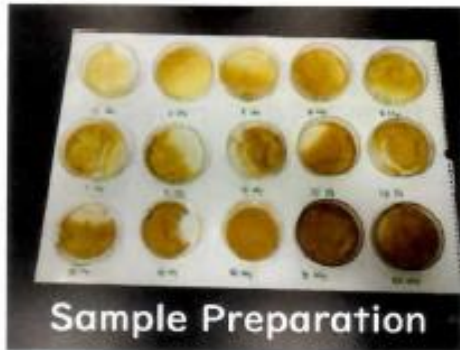
- Schedule delayed by the COVID-19
- Limited budget
- Feasibility study for up-scale production

Planning 2021

- Conduct field test, larger scale
- Apply research grants

I. Degraded chitosan for animal feeds

Feed supplement,
oligochitosan for chicken (Indonesia)

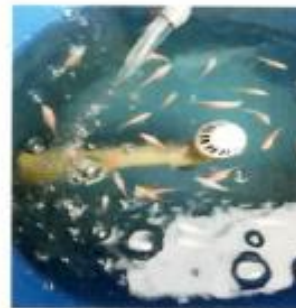


Funding from Educational
Fund Management Institutions
through Ministry of Research
and Technology/BRIN of
Indonesia.

Selenium nanoparticle
/oligochitosan for
recovering radiation
damage (Vietnam)



Feed supplement,
oligochitosan for Tilapia (Malaysia)



Final weight, growth rate, feed conversion
ratio, protein efficiency ratio and survival
rate changed better.

Current problems

Work from home,
Schedule delayed by the COVID-19
Limited budget

Planning 2021

Continuing study
Apply research grants
Conduct R&D in large scale
Commercialization oligochitosan

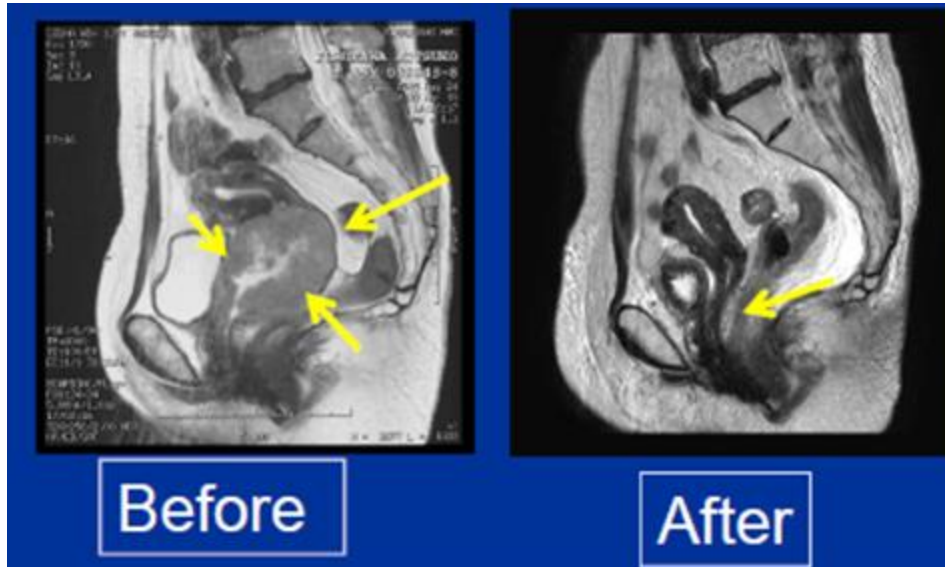
Project on Radiation Oncology

- 1996~ Radiation Therapy or Chemo-radiotherapy for Cervical Cancer
- 2005~ Chemo-radiotherapy for Nasopharyngeal Cancer
- 2009~ Hypofractionated Radiotherapy for Breast Cancer
- 2017~ CERVIX-V started.

In CERVIX-V, 3-D IGBT (Three Dimension Image Guided Brachytherapy) has been newly introduced.

- The aim of this project is to contribute to improving the radiation treatment techniques for cancers that are more prevalent in the Asian region.
- The protocols established by this project have been utilized in all the FNCA member countries.

Advanced uterine cervical cancer treated by new Protocol (CERVIX IV)



Overall survival rate (avg.)
2 year : 91%
5 year : 77%

**Challenge: Dissemination
to all hospitals in MCs**

Cervix-V

- To determine the safety and efficacy of IGBT for patients with locally advanced cervical cancer in FNCA countries.

Journal of Radiation Research, 2020, pp. 1–8
doi: 10.1093/jrr/rraa025

Journal of Radiation Research OXFORD

Preliminary survey of 3D image-guided brachytherapy for cervical cancer at representative hospitals in Asian countries

Noriyuki Okonogi¹, Masaru Wakatsuki^{1,2}, Hideyuki Mizuno¹, Shigekazu Fukuda¹, Jianping Cao, Henry Kodrat⁴, Fen Nee Lau⁵, Miriam Joy Calaguas⁶, Rey H. de los Reyes⁷, Yaowalak Chansilpa⁸, A.F.M. Kamal Uddin⁹, Tasbolat Adylkhanov¹⁰, Chul-Koo Cho¹¹, Uranchimeg Tsegmed¹², Nguyen Cong Hoang¹³, Tatsuya Ohno¹⁴, Takashi Nakano¹⁵, Shingo Kato^{16,8} and for the Forum for Nuclear Cooperation in Asia

¹GST Hospital, National Institute for Quantum and Radiological Science and Technology, Chiba, Japan
²Department of Radiology, Jichi Medical University, Shimotsuga, Japan
³School of Radiation Medicine and Protection, Medical College, Soochow University, Suzhou, China
⁴Department of Radiation Oncology, Faculty of Medicine, Universitas Indonesia, dr. Cipto Mangunkusumo Hospital, Jakarta, Indonesia
⁵Institut Kanisar Nagara, Putrajaya, Malaysia
⁶Department of Radiation Oncology, St Luke's Medical Center, Quezon City, The Philippines
⁷Department of Obstetrics and Gynecology, Jose R. Reyes Memorial Medical Center, JREC-NRMP Institute of Medicine, Metro Manila, Philippines
⁸Department of Radiology, Faculty of Medicine, Siriraj Hospital, Mahidol University, Bangkok, Thailand
⁹Department of Radiation Oncology, United Hospital Limited, Dhaka, Bangladesh
¹⁰Department of Clinical and Radiation Oncology, Ministry of Health of the Republic of Kazakhstan, Semey Medical University, Semey, Kazakhstan
¹¹Department of Radiation Oncology, Korea Institute of Radiological and Medical Sciences, Seoul, Korea
¹²Department of Radiation Oncology, National Cancer Center of Mongolia, Ulaanbaatar, Mongolia
¹³Department of General Radiation Oncology, National Cancer Hospital, Hanoi, Vietnam
¹⁴Department of Radiation Oncology, Gama University Graduate School of Medicine, Gama, Japan
¹⁵Quantum Medical Science Structures, National Institute for Quantum and Radiological Science and Technology, Chiba, Japan
¹⁶Department of Radiation Oncology, Saitama Medical University International Medical Center, Saitama, Japan

*Corresponding author: Department of Radiation Oncology, Saitama Medical University International Medical Center, 1-377-1 Yamaoka, Ihabiki City, Saitama, 350-1288, Japan. Tel: +81-42-984-4531; Fax: +81-42-984-4741; Email: s. kato@saitama-med.ac.jp (Received 29 November 2019; revised 13 February 2020; editorial decision 16 March 2020)

ABSTRACT

3D image-guided brachytherapy (3D-IGBT) has become a standard therapy for cervical cancer. However, the use of 3D-IGBT is limited in East and Southeast Asia. This study aimed to clarify the current usage patterns of 3D-IGBT for cervical cancer in East and Southeast Asia. A questionnaire-based survey was performed in 11 countries within the framework of the Forum for Nuclear Cooperation in Asia. The questionnaire collected the treatment information of patients with cervical cancer who underwent 3D-IGBT. The cumulative external beam radiotherapy and 3D-IGBT doses were summarized and normalized to a biological equivalent dose of 2 Gy per fraction (EQD₂) using a linear-quadratic model. Of the 11 institutions representing the participating countries, six (55%) responded to the questionnaire. Overall, data of 36 patients were collected from the six institutions. Twenty-one patients underwent whole-pelvic irradiation and 15 underwent whole-pelvic irradiation with central shielding. Patients received a median of four treatment sessions of 3D-IGBT (range, 2–6). All 3D-IGBT sessions were computed tomography (CT)-based and not magnetic resonance image-based. The median doses to the high-risk clinical target volume D₁₀₀, bladder D₁₀₀,

Registered patients

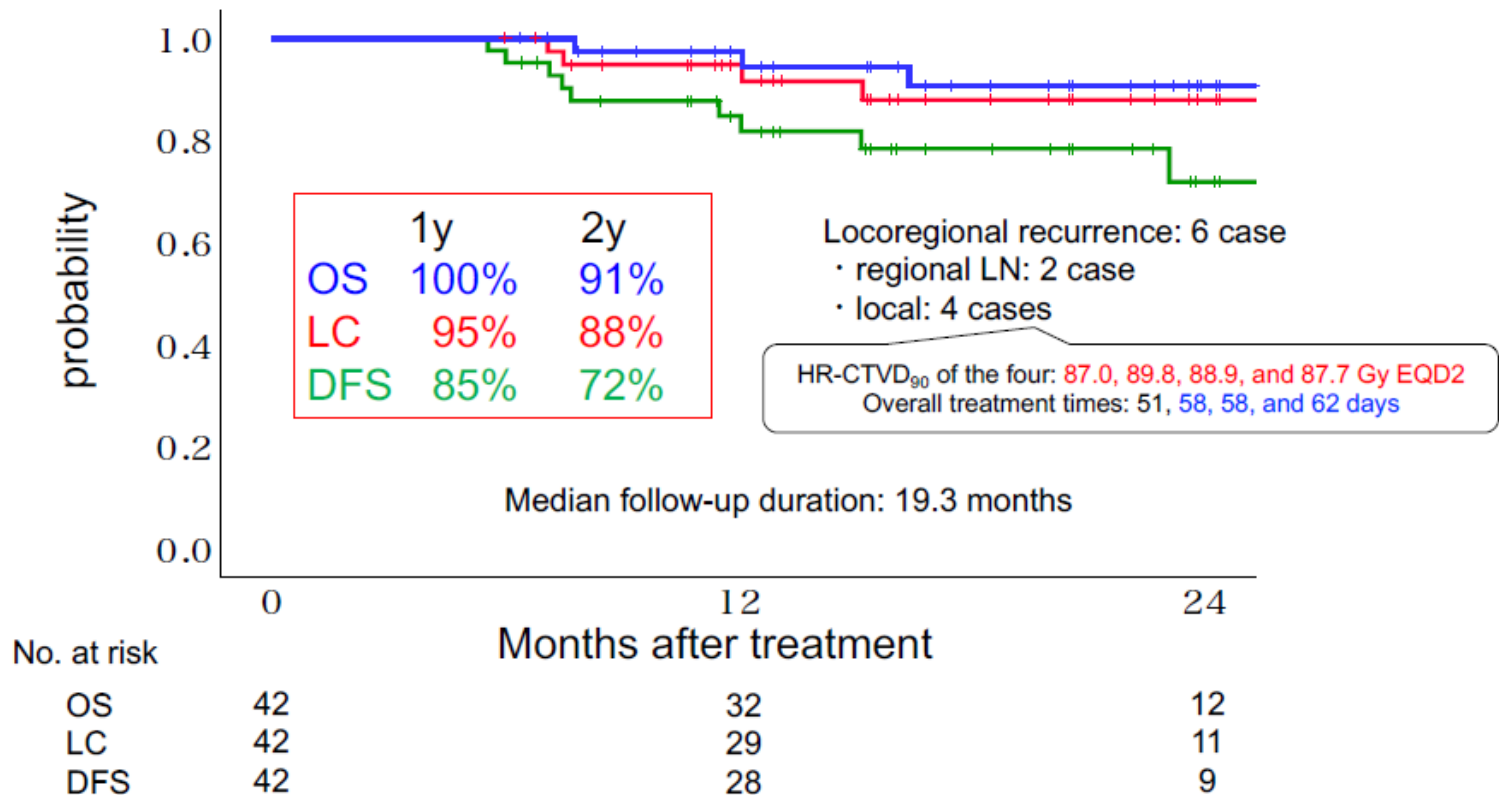
Patient accrual: 2017.5-2020.11 total 60 cases



Patients enrollment to Cervix-5 in your institution can be started after the approval of IRB in each institution.

Preliminary Results of Cervix-V

Local control, Overall survival, Disease-free survival (n = 42)



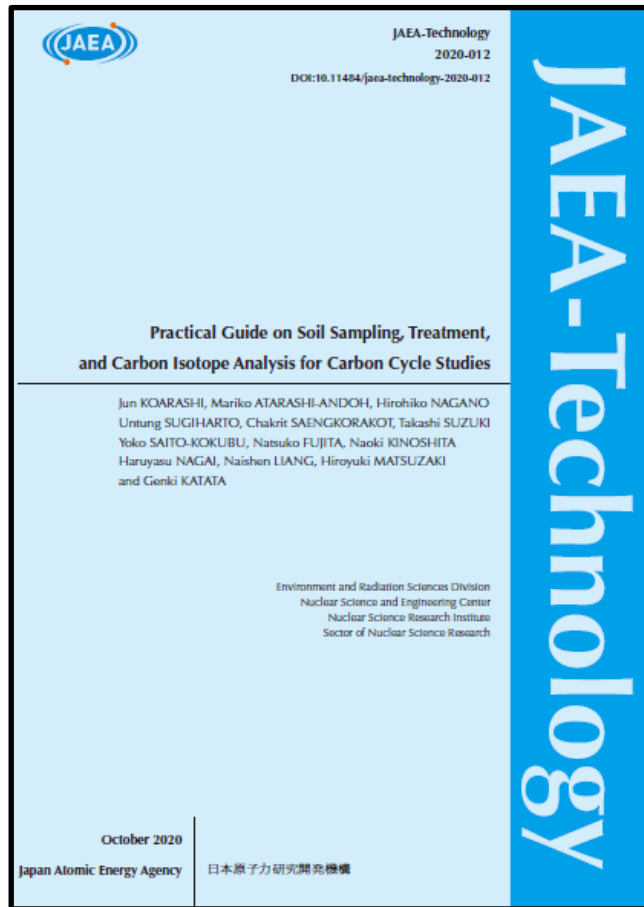
cf. FNCA Cervix-III (n = 120) (Conventional brachy)
 OS 79.6%(2 years)

Project on research on climate change using nuclear and isotopic techniques

- Using nuclear and isotopic techniques the project will identify and date past climate change with the goal of interpreting the drivers of the Earth's climate system. Two major directions of this project are analysis of the lake/soil sediment and organic carbon analysis in soil, to understand the regional paleo-climate mechanism and carbon circulation between air and soil.
- 2nd workshop was held in Indonesia in October 2018. During this workshop sample taking exercise of lake sediment was carried out by all the project leaders at one of Indonesian lakes.



“Practical Guide on Soil Sampling, Treatment, and Carbon Isotope Analysis for Carbon Cycle Studies” has been compiled in October 2020.



- This method will be applied to different forest sites (mangrove forests, etc.) in Asian region.
- Asian-scale database of soil organic carbon degradability will be constructed.
- Finally, the database will be provided to the climate change research community for improving predictions of long-term response of soil carbon to global warming.

Field researches, including selection of suitable areas for soil sampling provided for climatic, landscape and other natural peculiarities in Kazakhstan

Collaboration with the ISTC



The Project Proposal KZ-2611 - Revealing climate change and impact of man-made factors on contamination of the natural environment by studying radiocarbon concentration in the earth crust of the forest ecosystems of Kazakhstan

Foreign collaborators



**Japan Atomic
Energy Agency**

Aim of this project is to determine the level of climate change in the environment of Kazakhstan and the degree of impact of human activities to this change.

Tasks:

1. Development of a technique for soil samples collection and preparation for ^{14}C research.
2. Field researches, including selection of suitable areas for soil sampling provided for climate, landscape and other natural peculiarities.
3. Laboratory researches for determining ^{14}C concentration in soil samples, structure and physical and chemical properties of soil, concentration of radioactive substances in soil samples.
4. Processing, analysis and interpretation of the data obtained.

Project on Research Reactor Utilization

- Improve research reactor utilization in each FNCA member state.
- The following topics has been discussed for four years.
 - a. Neutron Activation Analysis (NAA)
 - b. Isotope Production including new isotopes
 - c. Neutron Scattering
 - d. Nuclear Science
 - e. Boron Neutron Capture Therapy, Neutron Radiography
 - f. Material Research
 - g. New Research Reactor
 - h. Human Resource Development
- NAA project and Research Reactor Network Project have been merged.

Interim Report on Low Level Radioactive Repositories (March 2020)

	<p>FNCA Forum for Nuclear Cooperation in Asia</p>	<p style="text-align: center;">CONTENTS</p> <p>PREFACE i</p> <p>Framework of Regional Cooperation under FNCA ii</p> <p>AUSTRALIA</p> <p>-Part I. General Outline of LLW Repository- 1</p> <p>-Part II. Specific Site Safety Assessment of LLW Repository- 10</p> <p>BANGLADESH</p> <p>-Part I. General Outline of LLW Repository- 18</p> <p>-Part II. Specific Site Safety Assessment of LLW Repository- 22</p> <p>CHINA</p> <p>-Part I. General Outline of LLW Repository- 27</p> <p>-Part II. Specific Site Safety Assessment of LLW Repository- 35</p> <p>INDONESIA</p> <p>-Part I. General Outline of LLW Repository- 43</p> <p>-Part II. Specific Site Safety Assessment of LLW Repository- 54</p> <p>JAPAN</p> <p>-Part I. General Outline of LLW Repository- 64</p> <p>-Part II. Specific Site Safety Assessment of LLW Repository- 77</p> <p>KAZAKHSTAN</p> <p>-Part I. General Outline of LLW Repository- 92</p> <p>-Part II. Specific Site Safety Assessment of LLW Repository- 109</p> <p>MALAYSIA</p> <p>-Part I. General Outline of LLW Repository- 120</p> <p>-Part II. Specific Site Safety Assessment of LLW Repository- 128</p> <p>MONGOLIA</p> <p>-Part I. General Outline of LLW Repository- 135</p> <p>THE PHILIPPINES</p> <p>-Part I. General Outline of LLW Repository- 141</p> <p>-Part II. Specific Site Safety Assessment of LLW Repository- 144</p> <p>THAILAND</p> <p>-Part I. General Outline of LLW Repository- 147</p> <p>-Part II. Specific Site Safety Assessment of LLW Repository- 159</p> <p>VIETNAM</p> <p>-Part I. General Outline of LLW Repository- 163</p> <p>RECENT ACTIVITIES 168</p> <p>CONTRIBUTORS 169</p>
<p style="text-align: center;">FNCA Consolidated Report on Low Level Radioactive Waste Repository (Interim Report)</p>		
<p style="text-align: center;">March 2020</p>	<p style="text-align: center;">Radiation Safety and Radioactive Waste Management Group, Forum for Nuclear Cooperation in Asia (FNCA)</p>	

New Direction of Nuclear Security and Safeguards Project

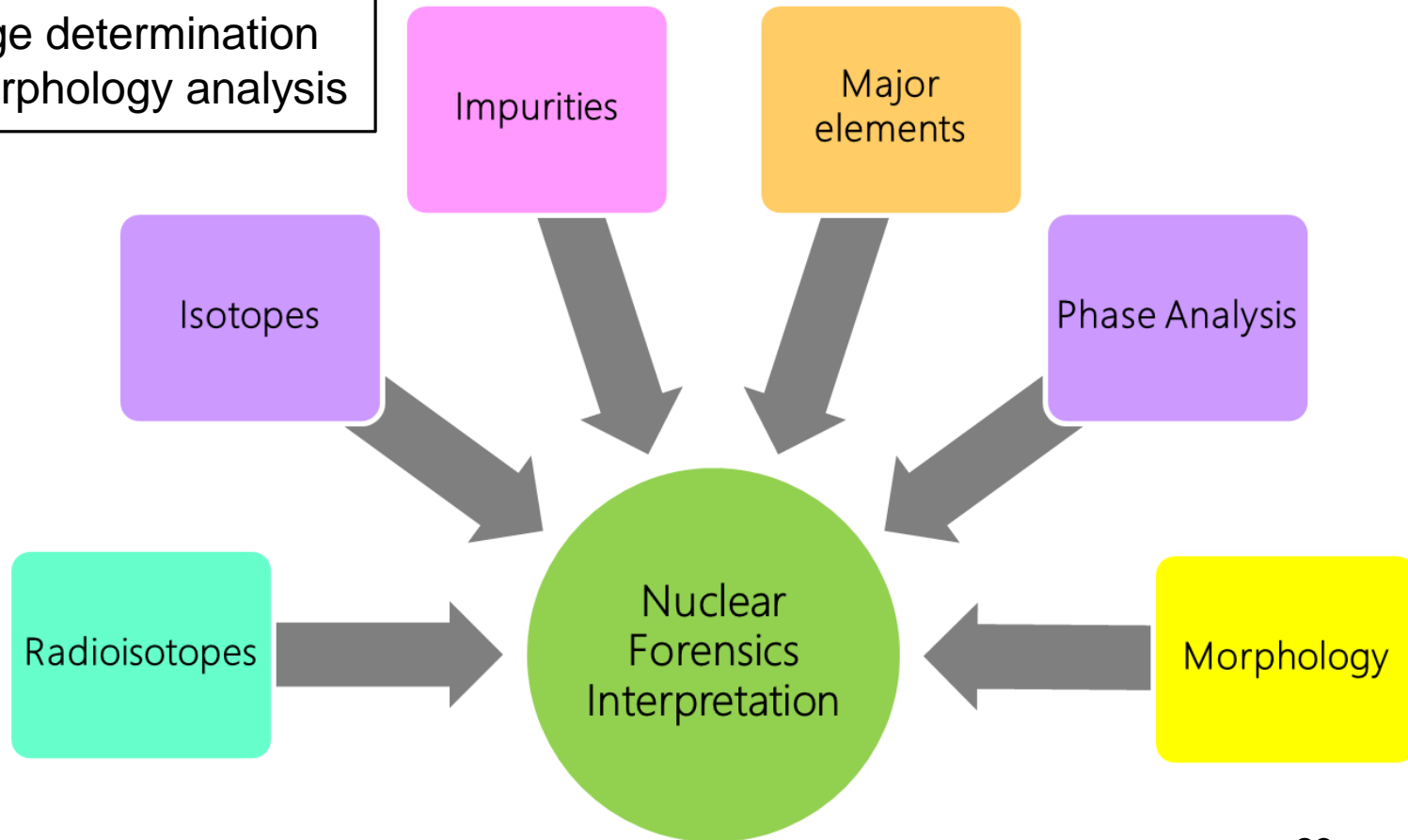
CDM agreed to begin new phases of Nuclear Security and Safeguards with the following comments.

- Nuclear forensics, cyber security, and the security of radioactive sources should be intensively discussed for three years in order to build an effective international mechanism for nuclear materials security in Asia, which is urgently expected in the world.
- Human resource development in nuclear security is strongly expected to be promoted through this project.

Nuclear Forensics (NF) Analysis Technologies

Four Key Technologies for NF:

- Isotope ratio measurement
- Impurity measurement
- Uranium age determination
- Particle/Morphology analysis



MEXT Human Resource Development Program

Number of Participants

Nuclear Researchers Exchange Program

	JFY2018	JFY2019	JFY2020
Bangladesh	3	6	4
China	2	3	0
Indonesia	3	3	1
Kazakhstan	1	1	0
Malaysia	1	2	0
Mongolia	2	1	0
The Philippines	1	1	0
Sri Lanka	1	0	0
Thailand	3	3	0
Vietnam	3	2	3
Total	20	22	8

Instructors Training Program

(online)

	JFY2017	JFY2018	JFY2019	JFY2020
Bangladesh	9	11	10	11
China	0	0	0	0
Indonesia	7	6	8	12
Kazakhstan	5	4	8	9
Malaysia	12	13	11	21
Mongolia	9	9	7	13
The Philippines	7	4	4	49
Sri Lanka	4	4	4	2
Thailand	15	6	13	43
Vietnam	8	13	10	45
Turkey	4	9	8	14
Saudi Arabia	0	3	0	0
Total	80	82	84	219

THANK YOU
FOR
YOUR ATTENTION