

November 7, 2018

Introduction and Overview of FNCA (Forum for Nuclear Cooperation in Asia)

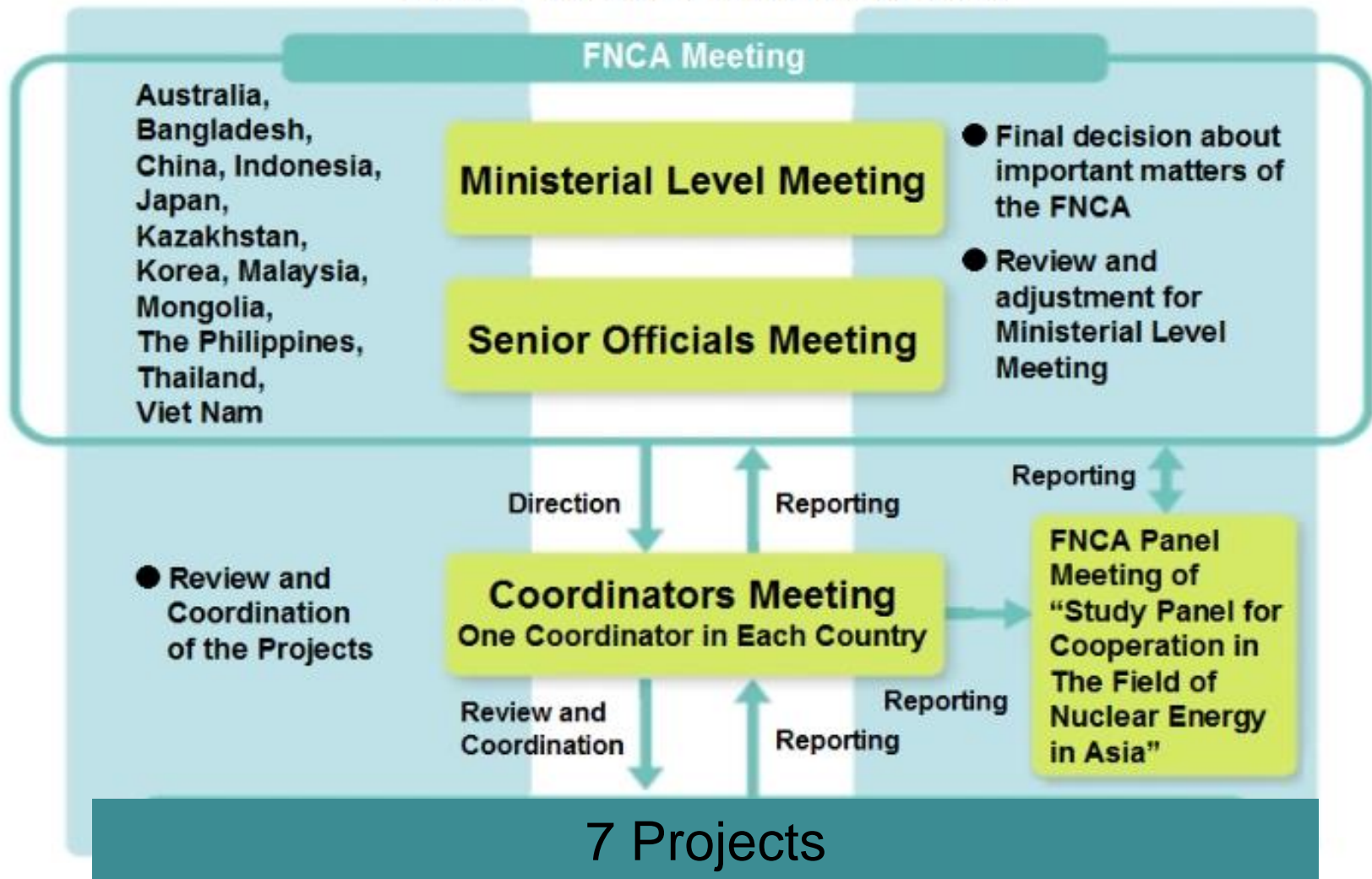
Tomoaki WADA
FNCA Coordinator of Japan

FNCA Open Lecture on Radiation Oncology
Dhaka, Bangladesh

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



Ministerial Level Meeting in October 2017 (Astana)

- Further accelerating FNCA's activities related to the application of nuclear science and technology with the main focus in the areas of environment protection, health/medicine and agriculture
- Promoting cooperation with international organizations in the field of legal frameworks
- Encouraging the member countries to promote technologies tackling with environment pollution directly, in addition to the technology of monitoring



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

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

Farmer's variety

NMR 152 (in M5)

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

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

Bangladesh

BINA Dhan 14 registered in 2013 (in M4) (from ion beam)

**Tolerant to drought (25-30% less water needed),
Early heading, Short culm, High yield (6.9t / ha)
Economic impact : 1800 million USD/year**

BINA Dhan 18 registered in 2015 (from ion beam)

**BINA Dhan 19 (upland rice) registered in 2016 (in M4)
(from ion beam)**

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.

Rice fields sprayed with PGP exposed to typhoons in the Philippines



Ricefields sprayed with PGPs (left) proved much more resilient to lodging compared to the ricefields without PGPs (right) when exposed to typhoons. (2015)

Super Water Absorbent (SWA)



SWA enable farmers to save watering and increase yield in sandy soil



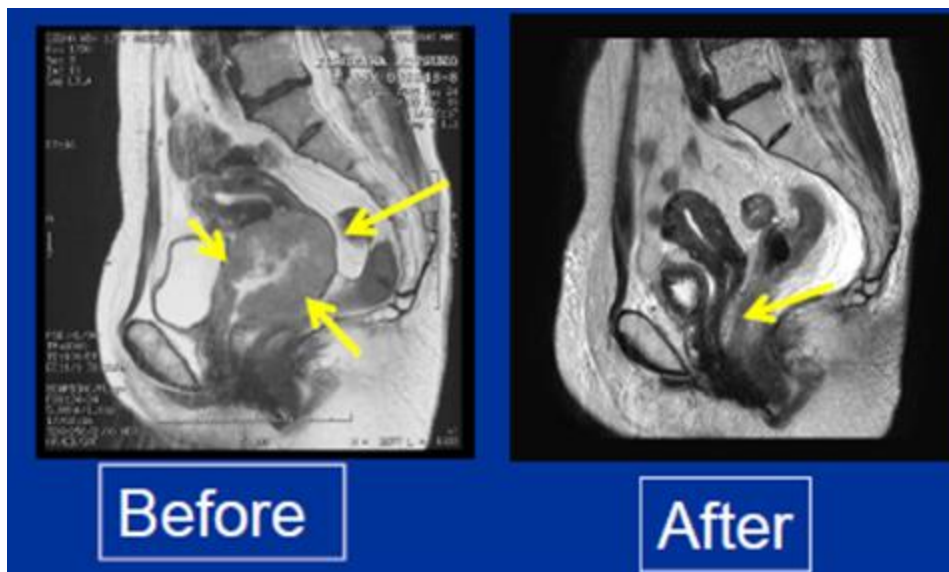
Project on Radiation Oncology

- 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**

Conclusion of CDM on CERVIX V

- March 2017

It is strongly expected that the optimal treatment protocol of radiotherapy and chemotherapy for cervical cancer (CERVIX-V), including state-of-the-art techniques of radiotherapy, will be established and disseminated in three years.

- March 2018

CDM suggested holding a hands-on-training course on 3D-IGBT during the workshop in 2018 to train radiation oncologists and medical physicists, since 3D-IGBT (three dimensional image-guided brachytherapy) is used in the treatment protocol, a new clinical study, or CERVIX-V.

Project on Research Reactor Utilization

- Improve research reactor utilization in each FNCA member state.
- The following topics will be discussed in three 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.

Project on research on climate change using nuclear and isotopic techniques

- New project for 2017-2019
- This project will assist member countries with the application of nuclear and isotopic techniques to understand vulnerability and resilience of ecosystems and landscapes to climate change.
- Using these techniques the project will identify and date past climate change with the goal of interpreting the drivers of the Earth's climate system.
- Focusing on analysis of the lake/soil sediment and organic carbon analysis in soil.



Conclusion of 2017 Coordinators Meeting on Radioactive Waste Management

CDM agreed to begin new phases of the Radiation Safety and Radioactive Waste Management Project with the following comments.

- Since almost all countries in the FNCA are planning to construct low-level radioactive waste disposal facilities/long-term storage facilities, this project should assist the member countries with safety improvement related to radiation safety and radioactive management of low-level radioactive waste repositories.

New Direction of Nuclear Security and Safeguards Project

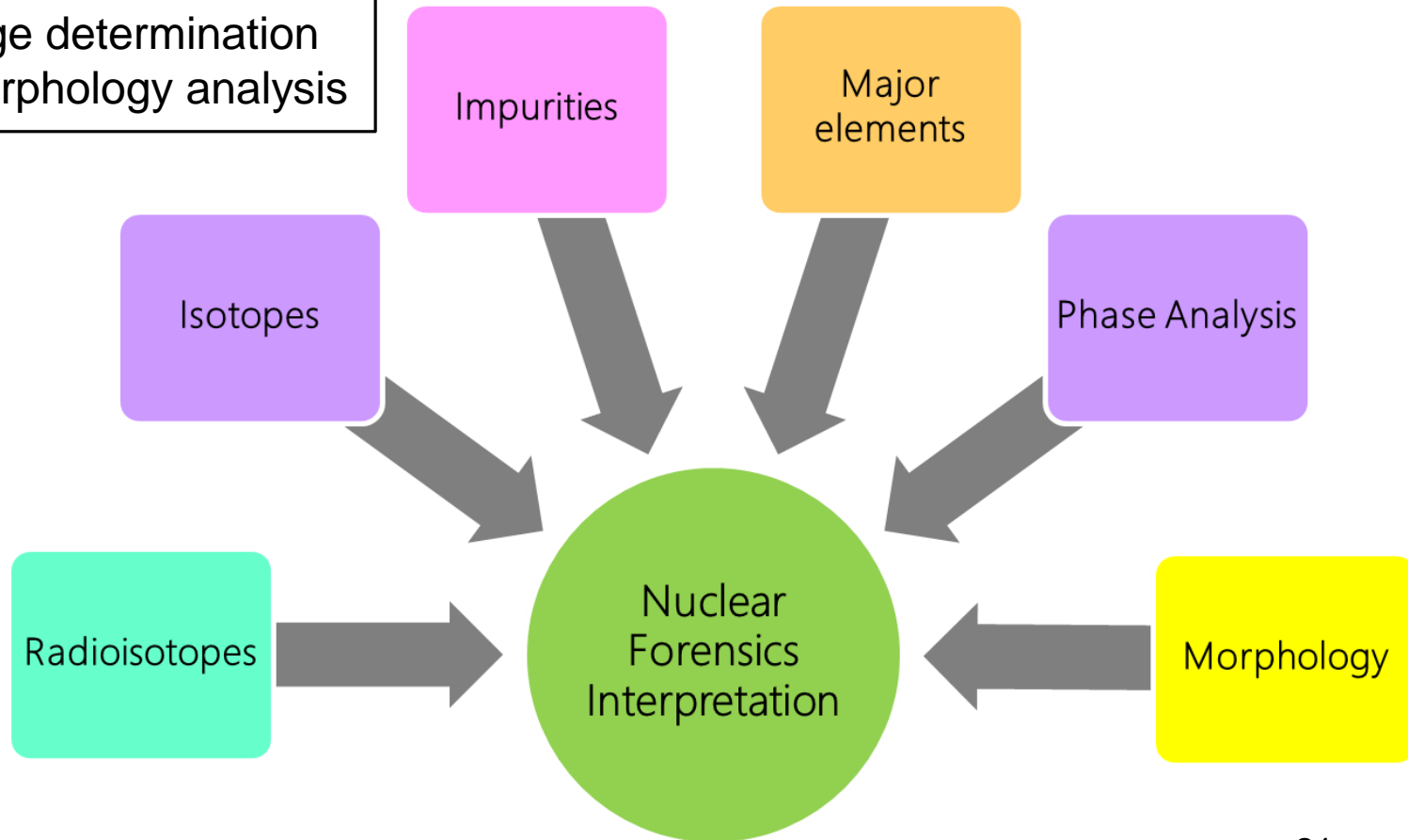
CDM agreed to begin new phases of Nuclear Security and Safeguards with the following comments.

- 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



FNCA Awards

- FNCA awards were introduced for the first time last year, in order to encourage future project activities. One country was selected for the "Best Research Team of the Year" while four others for the "Excellent Research Team of the Year".
- The "Best Research Team of the Year 2017" was awarded to Australia's "Research Reactor Network" team, while the "Excellent Research Teams of the Year 2017" were awarded to Bangladesh's "Radiation Oncology" team, Malaysia's "Mutation Breeding" team and "Human Resources Development" team, and the Philippines' "Electron Accelerator Application" team, respectively.



FNCA Activities and MEXT Training Programs on Nuclear Energy and Radiation Utilization

Forum for Nuclear Cooperation in Asia (FNCA)

Nuclear Researchers Training Program

1. FNCA Research Course

This course is set up to perform research activities related to the FNCA project themes. (3~6months)

2. Individual Research Course

This course is set up to match the ANTEP Needs from Asian Countries. (3~6months)

3. Basic and Fundamental Course

This course is set up to give various lectures on Nuclear Engineering/Nuclear Safety Engineering. (1~3months)

NSRA

Instructors Training Program

1. Instructors Training Course

This course is set up to invite participants, who are expected to be instructors in their countries in the future. (6~8weeks)

2. Follow-up Training Course

Japanese experts visit Asian countries and give a technical advice to local instructors who have participated in Instructors Training Course. (1~2weeks)

3. Seminars on Nuclear Technologies

- (1) Nuclear Plant Safety
 - (2) Atomic Energy Administration
 - (3) Basic knowledge of Radiation
 - (4) Site Location of Nuclear Facility
- (1~4weeks)

JAEA

MEXT Human Resources Development Program

< Nuclear Researchers Training Program >

	JFY2015	JFY2016	JFY2017
Bangladesh	4	2	3
China	1	1	3
Indonesia	3	1	1
Kazakhstan	1	1	1
Malaysia	1	3	2
Mongolia	0	1	2
The Philippines	2	2	1
Sri Lanka	1	3	2
Thailand	3	3	2
Vietnam	4	6	3
Total	20	20	20

< Nuclear Instructors Training Program >

	JFY2015	JFY2016	JFY2017
Bangladesh	8	9	9
China	0	0	0
Indonesia	8	7	7
Kazakhstan	5	4	5
Malaysia	8	10	12
Mongolia	6	6	9
The Philippines	5	7	7
Sri Lanka	5	5	4
Thailand	8	14	15
Vietnam	13	9	8
Turkey	10	4	4
Saudi Arabia	1	1	0
Total	77	76	80

**THANK YOU
FOR
YOUR ATTENTION**