

October 30, 2019

# Introduction and Overview of FNCA

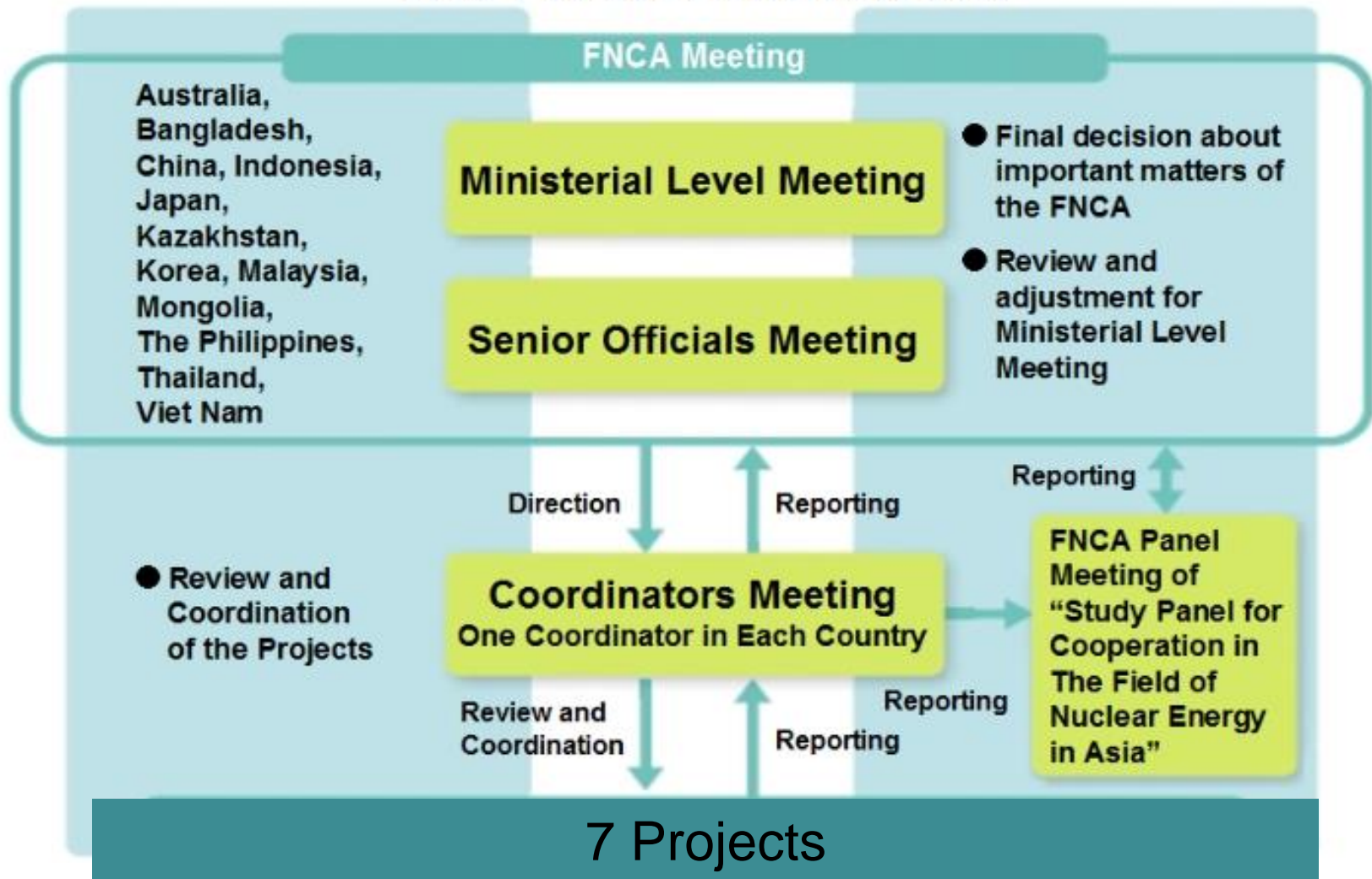
Tomoaki WADA  
FNCA Coordinator of Japan

FNCA Open Lecture on Radiation Oncology  
Suzhou, China

# 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

# Ministerial Level Meeting in December 2018 (Tokyo)

- Further accelerating FNCA activities not only by accelerating the existing R&D themes but also by adopting possible future R&D themes of a wide spectrum of interests from the member countries
- Encouraging the member countries to bring the R&D products of such projects as mutation breeding, radiation processing and polymer modification to the end-users including the private sector
- Encouraging member countries to reinforce the promotion of radiation oncology in transition from experimental phase to practicing phase, with dissemination of the published protocols and hands-on training through the cooperation
- Promoting cooperation with international organizations



# 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.

# Mutation Breeding



**Disease resistant banana in the Philippines**



**Insect resistant orchid in Malaysia**



**New disease resistant rice variety in Vietnam (right):  
5-14% yield increase**



# 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**



# 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

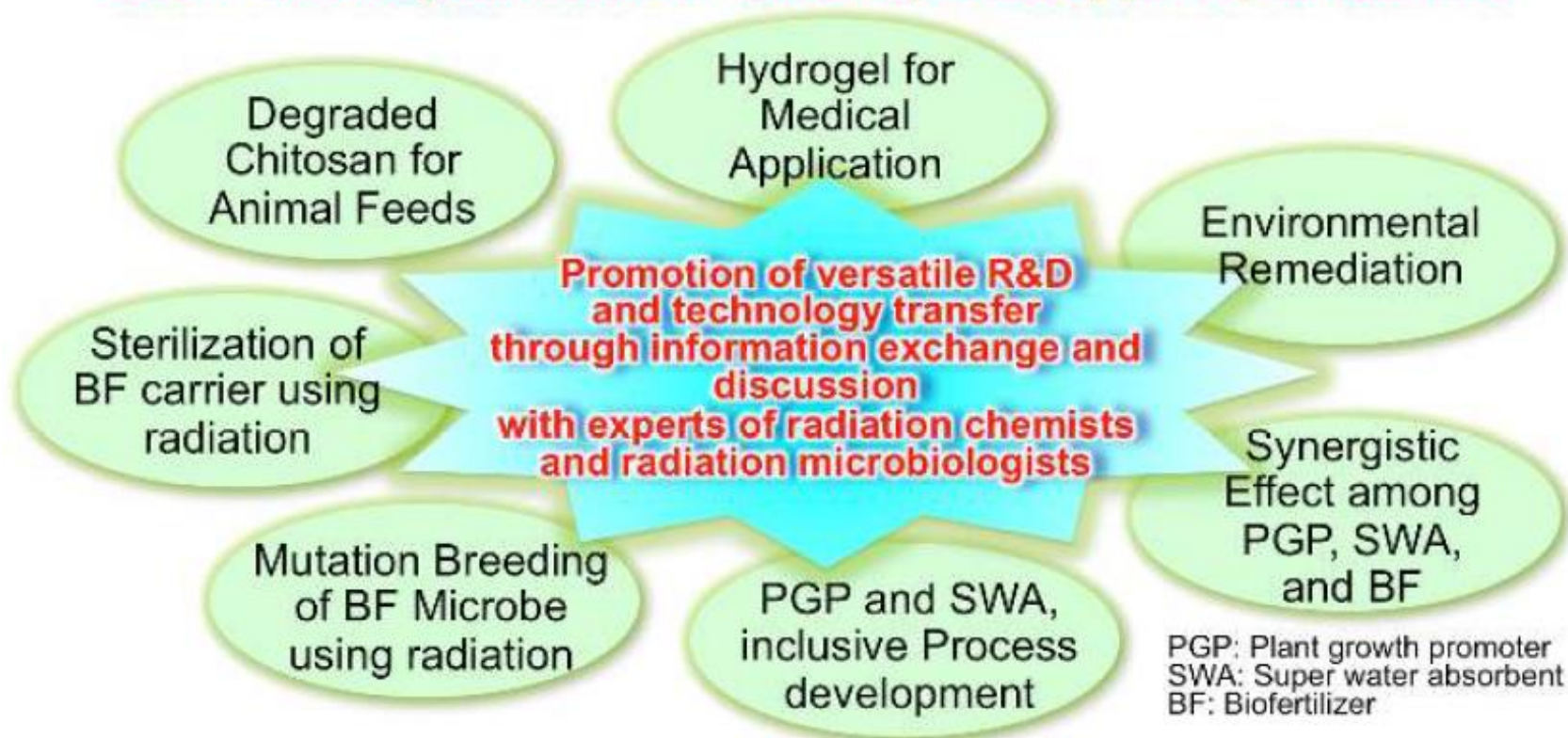
To develop a plant growth promoter and elicitor by degradation of natural polymers as well as applications of radiation cross-linked hydrogel for super water absorbent, aiming for technical transfer to the end users.

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



# Research areas in RPPM Project

Seven R&D subjects based on Needs requested by participant countries



# Plant Growth Promoter (Indonesia)

**Corn plant** Kanigoro village, Blitar Regency, East Java Province,



Downy Mildew disease

Chitosan 150 ppm every week



**Yield**

treatment	Yield/ha (kg)	Increase (%)
chitosan	7000	23
control	5710	

# Degraded Chitosan for Animal Feeds

Cihateup duck (Indonesia)



Addition of Oligochitosan (200 mg /kg-feed) increased blood glucose, albumin, globulin, and egg weight

Striped catfish(Vietnam)



600 tons feed (100 mg degraded chitosan/kg-feed) to 800,000 fishes for 9 months

	Average survival rate (%)	Average FCR
Chitosan added	83.2	1.48
Control	78.4	1.58



F.C.R. = Feed given / Animal weight gain

Talapia (Malaysia)



Experiment starts based on aquaculture production of 49 %, followed by catfish (37 %) and carps (10 %) in freshwater

## Major Gaps in Basic aspects

- 1) Little study on optimum molecular weight of oligochitosan as animal feed

## Major Gaps in Application aspects

- 2) Limited collaborator such as institution and farmer to conduct field test because it is costly and time consuming.

## Major Implementation plans

- 1) Study on optimum molecular weight of oligochitosan as animal feed and a new additives containing Se nano particles/ oligochitosan
- 2) Development of cost-effective method in the field test



# 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.



# 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.

# Hands-on Training of CERVIX-V at United Hospital in Bangladesh (November 2018)



## Cancer specialists visit United Hospital



Photo: Collected

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### City Desk

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A 30-member team of cancer specialists from the Forum and Nuclear Cooperation in Asia (FNCA) recently visited United Hospital Cancer Care Center, says a press release. Prof Shingo Katto and Prof Masru Waka Suki from Japan, along with specialists from Indonesia, Malaysia, Thailand, China, Kazakhstan, the Philippines, Vietnam, Mongolia and Bangladesh were also present. They conducted a training session and visited the hospital's radiation therapy facility. The hospital's Managing Director Faridur Rahman Khan, CEO Faizur Rahman, Chief of Communications Dr Shagufa Anwar and oncologists were also present on the occasion. 5656565

# 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.

# Boron Neutron Capture Therapy

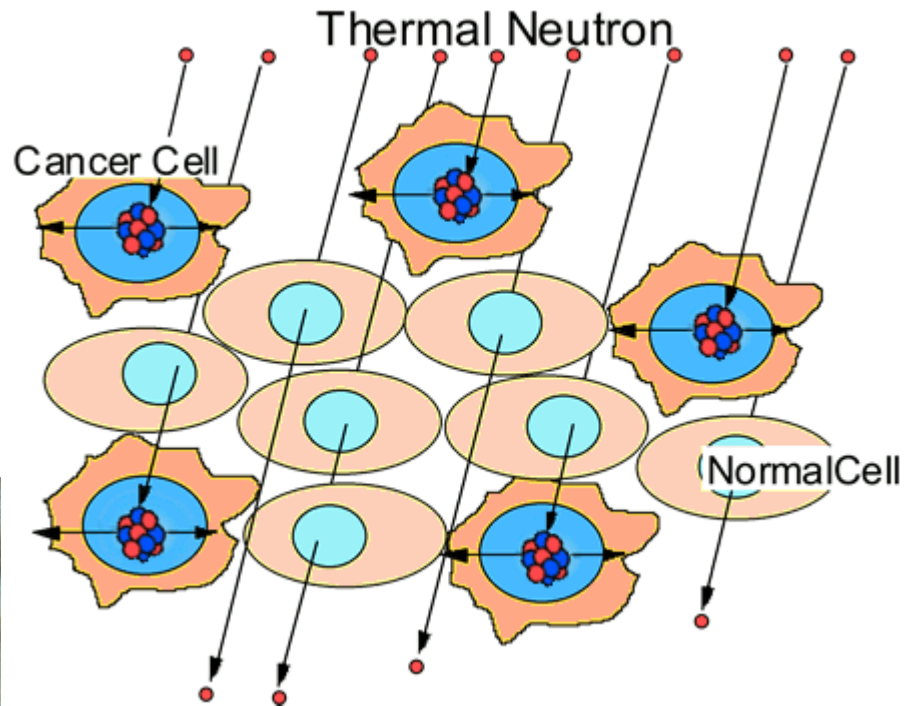


*binary technique*

*high LET particles*

*BNCT could become useful for highly-fatal tumours:*

- *Extended (e.g. liver, lung)*
- *Radioresistant (melanoma)*
- *Localized near vital organs (glioblastoma)*





# 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 last year. During this workshop sample taking exercise of lake sediment was carried out by all the project leaders at one of Indonesian lakes.





### Hadapi Iklim dengan Nuklir

Penulis: STEFF THENU  
Media: Selasa, 28 Sep 2018, 08:00 WIB | [BERKAWAN](#)

## Teknologi Nuklir Solusi Atasi Dampak Perubahan Iklim

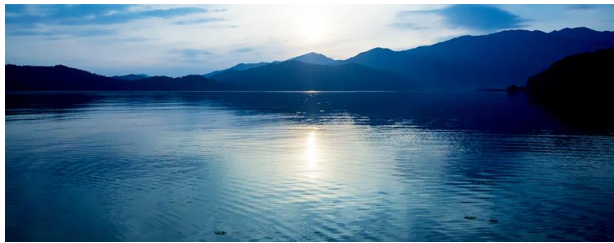
### 気候変動の影響を克服するための核技術を用いた解決方法



Kepala Batan Djarot Sulisto Wisnubroto (kelima dari kiri) dan para narasumber berfoto bersama sebelum pertemuan Forum for Nuclear Cooperation in Asia (FNCA) di ruang sidang Sekolah Pascasarjana Undip, Serin, 24 September 2018. (Foto: suara pembaruan / steff thenu)  
2018年9月24日曜日、UNDIP大学の会議室にて、アジア原子力協力フォーラム（FNCA）に先立ち撮影されたグループ写真。Batn Djarot Sulisto Wisnubroto（左から5番目）（写真：sound update / steff thenu）  
Steff Thenu | JEM Serin, 24 September 2018 | 14:31 WIB

**Semarang** - Isu dampak perubahan iklim tidak hanya menjadi perbincangan hangat di dalam negeri saja, melainkan sudah mendunia. Bahkan pada sidang umum Badan Tenaga Atom Internasional atau Atomic Energy Agency (IAEA) ke-62 yang berlangsung seminggu ini juga mengangkat isu peran teknologi nuklir dalam memberikan solusi dampak perubahan iklim.

# Discussions on Lake Suizetsu sediments of the past 70,000 years (2019 workshop)





# 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.

# Report on low level radioactive waste repositories (March 2020)

- General Part
  1. General policy
  2. Principles and Safety Assessment
  3. Regulatory and Operational System Preparation
  4. Site Selection
  5. Design and Construction of Disposal Facilities
- Specific Part
  1. General Considerations for Safety Assessment
  2. Specific LLW Repository site (planning etc.)
  3. Guidelines for Safety Assessment
  4. Confidence Building

# **New Direction of Nuclear Security and Safeguards Project**

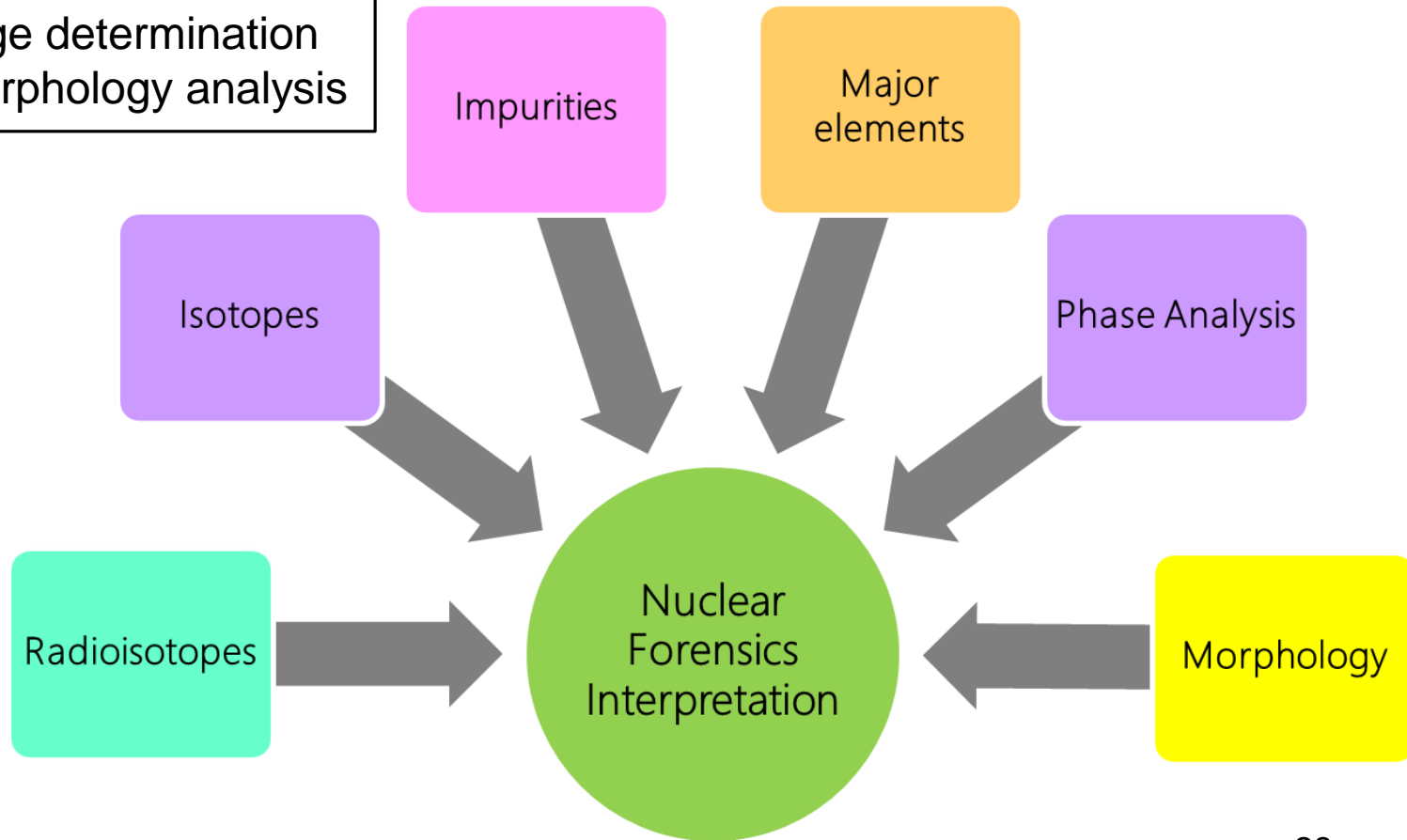
CDM agreed to begin new phases of Nuclear Security and Safeguards with the following comments.

- 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 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>

	JFY2016	JFY2017	JFY2018
Bangladesh	2	3	3
China	1	3	2
Indonesia	1	1	3
Kazakhstan	1	1	1
Malaysia	3	2	1
Mongolia	1	2	2
The Philippines	2	1	1
Sri Lanka	3	2	1
Thailand	3	2	3
Vietnam	6	3	3
<b>Total</b>	<b>20</b>	<b>20</b>	<b>20</b>

<Nuclear Instructors Training Program>

	JFY2016	JFY2017	JFY2018
Bangladesh	9	9	11
China	0	0	0
Indonesia	7	7	6
Kazakhstan	4	5	4
Malaysia	10	12	13
Mongolia	6	9	9
The Philippines	7	7	4
Sri Lanka	5	4	4
Thailand	14	15	6
Vietnam	9	8	13
Turkey	4	4	9
Saudi Arabia	1	0	3
<b>Total</b>	<b>76</b>	<b>80</b>	<b>82</b>

**THANK YOU  
FOR  
YOUR ATTENTION**