# TEWS2025JPN “RP NORM”

TEWS 2025 JPN

The INSTA Spring School of Advanced Radiation Protection
Focusing on NORM under Risk Management & Communication



Held in March 2025 (Online and On-site), Japan

## OVERVIEW

**Name of the Programme:**
The INSTA Spring School of Advanced Radiation Protection Focusing on NORM under Risk Management & Communication

**Organiser:**
The International Nuclear Science and Technology Academy (INSTA)

**Host:**
The Japanese Volunteer's Expert Team (JVET)

**Supported by**
The University of Tokyo (UTokyo) and Science and Technology Information Forum (STIF)

**TEWS2025JPN committee:**

| | | |
|---|---|---|
| Director | : | Takeshi IIMOTO, Prof./PhD/Mr (UTokyo) and Coordinator of JVET |
| Secretariat | : | Rieko TAKAKI, Secretariat of JVET, Executive of STIF, Representative of the Energy Communication Planning (ECP) |

Editorial Board for Official Report

| | | |
|---|---|---|
| Editor in-chief | : | Md. Mahamudul HASAN, Project researcher/PhD/Mr (UTokyo) |
| Editors | : | Yu IGARASHI, Project assistant professor/PhD/Mr (UTokyo)<br>Hiromi KOIKE, Project assistant professor/PhD/Ms (UTokyo)<br>Qianhao JIN, Doctoral student/Mr/JE (UTokyo) |
| Managements | : | Handling online and onsite sessions-all junior experts (JEs) |
| Analysis (Examination) | : | Changting GUH, Mr/JE (UTokyo) |
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| Video making | : | Changting GUH, Mr/JE (UTokyo)<br>Yifan SHI, Ms/JE (UTokyo) |
| Illustration | : | Haruka MORISAKI |
| Cultural support | : | Asheda Anwar NANCY, Ms/ JE supporter |

## TEWS2025JPN HOST TEAM MEMBERS

Under the leadership of Prof. Takeshi Iimoto – the Local Director of the event, the TEWS2025JPN organising team on behalf of the JVET – consists of the Secretariat, assistant professors, project assistant professor, project researchers, staffs of the UTokyo, Junior Experts (JEs) ‐ students at the associate institute of the JVET are mainly at the UTokyo – and other supporters. The JEs played a crucial role in supporting daily activities and controlling TEWS event activities in sharing presentations, controlling ZOOM during online sessions, whilst preparing daily reports on presentation and activity contents and guiding in-person activities of participants at the UTokyo and site-visits. The whole teamwork-oriented activities focused not only on the planned training activities of the TEWS2025JPN courses but also encompassed cultural, religious and international activities, triggering the whole TEWS2025JPN programme for further stability and effectiveness.




Figure 1: TEWS2025JPN host team, Japan led by Prof. Takeshi IIMOTO

## INTRODUCTION OF TEWS2025JPN MANAGEMENT COMMITTEE

### The International Nuclear Science and Technology Academy (INSTA)

The INSTA – a regional educational initiative supported by the IAEA's Technical Cooperation Programme (TCP) – has a mission to contribute for the global nuclear human resource development (HRD) through regional and inter-regional collaborations in Asia and the Pacific region to empower educators and practitioners and to advance Nuclear Science and Technology (NST) education programmes at both secondary and tertiary levels.

**The Strategy for Building Educators' Skills towards Facilitating Learning on NST Topics in Sustained Manner:**[1]

**Symbolises** the INSTA's vision.

**Is** a new regional educational initiative in the Asia-Pacific region.

**Is** a forum of cooperation and collaboration among universities, training centres, research organisations, regulatory bodies, and other relevant nuclear agencies.

**Envisions** strong, growing and empowered NST educators who advance the safe, secure, peaceful and beneficial use of NST globally.

**Has** a mission to contribute to the global nuclear HRD through regional and inter-regional collaborations for empowering educators and advancing NST education programmes at the secondary and tertiary level.

**The regional educational initiative supported by IAEA**[2]

Sustainability of nuclear applications and its contributions to prosperity and improved quality of life are achieved through a competent and motivated workforce. In the Asia- Pacific region, the potential use of NST to contribute for their economic growth remains underutilised owing to the limited number of equipped educators and workers in the field in some Member States (MSs).

Cognizant of the foregoing challenges, the IAEA called upon experts from 7 MSs in the region in November 2019 to discuss applicable solutions, which develops and enhances NST-centred education focused not only to educators already in the NST field but from all other scientific, technical and social disciplines. It is envisaged that this strategy will accelerate the dissemination and awareness and subsequently the utilisation of NST applications in the region. The meeting concluded that forum of cooperation and collaboration among universities, training centres, research organisations, regulatory bodies and other relevant agencies is needed to address for filling identified gaps. Bearing it in mind, the INSTA was established.

### The Japanese volunteer's Expert Team (JVET)

The JVET stands for Japanese volunteer's Expert Team which focuses on contributing to international HRD in the field of NST[3].

The JVET is originally a team of practitioners who have voluntarily joined activities including the TCP of the IAEA, which started in 2011. The JVET consists of members who have been deeply involved in the training of secondary level school students and teachers in Asia and the Pacific region. They are now expanding its scope of human resources by including tertiary level university- and postgraduate students, as well as young professionals.

Japanese experts in the field of NST who agreed with their aims and policies of activities employ this framework to cooperate amongst the international community with each other and exchange & share educational tools, materials, know-how and experiences. The framework of the JVET helps the international community to promote and to improve our own HRD activities of each member.

Prof. Takeshi Iimoto, the UTokyo is working as the coordinator and Ms. Rieko Takaki from the ECP serves the JVET as the secretariat.

### Prof. Takeshi Iimoto (IIMOTO Laboratory), the UTokyo

Prof. Iimoto is a professor at the Division for Environment, Health and Safety at the UTokyo. Concurrently, he is in the service as a professor at the Department of Environment Systems of the University, whilst leading his laboratory performing both academic research focusing on the environmental/radiation safety management and regulatory/strategy development of radiation education/module across the world under the IAEA's TCP and any other relevant departmental programme. He is also a member of Japanese academic associations including the Japan Health Physics Society and the Japan Atomic Energy Society. Also, he serves an expert member for several Japanese national committees or meetings for radiation protection and safety as well as radiation education, whereas contributing as an IAEA expert to develop radiation protection strategies and educational training modules for the Asia-Pacific region – the Executive Secretary of the INSTA Steering Committee is also his incumbency.

Prof. Iimoto is the Radiation Safety Promotion Manager (RSPM) at the University, tackling for the safety culture improvement by having served as the former vice-president of the Japan Health Physics Society, and the editor-in-chief of Journal of Radiation Protection Research (JRPR), co-operated by RP societies in Republic of Korea, Australia and Japan. He has been one of the IAEA Experts as above involved in TCPs since 2012 and has shared his broader practical knowledge and experiences in the radiation protection for the TC-recipient countries in the Asia-Pacific region[4,5].

The IIMOTO laboratory comprises of professors, assistant professor, project assistant professors, researchers, collaborative researchers and graduate students. IIMOTO lab is a main associate institute of the TEWS2025JPN on behalf of the JVET.

The laboratory's main research interests embrace radiation protection, radiation safety, radiation measurements, dosimetry, radiation control, environmental radiation and radioactivity, radiation education, risk education and risk communication. With a motto of 'STUDY HARDER and PLAY HARDER', the laboratory encourages academic research, develops national and international strategies and tools and promotes radiation protection/NORM/safety management[6–8].






Figure 2: Prof. IIMOTO, and his laboratory members, the UTokyo, is one of the associate institutes of TEWS2025JPN

## MESSAGES FROM the INSTA

### The INSTA CHAIR

**Dr. Irman ABDUL RAHMAN**

**The Chair of the INSTA Steering Committee**
**Associate Professor, National University of Malaysia**



First and foremost, please let me congratulate all of you for being selected to take part in TEWS2025JPN Japan, the first ever INSTA School, hosted by the JVET, a member of the INSTA.

The INSTA has planned series of these schools as flagship events, to enhance understanding and knowledge of nuclear science and technology applications to educators.

As places for these INSTA schools are very limited and in high demand, it is my hope that all participants take full advantage of this opportunity to network and learn as much as you can about the topic covered in this school.

But more importantly, please enjoy this experience!

**Organiser OF TEWS2025JPN JPN**

**Prof. Dr. Takeshi IIMOTO**

**Coordinator of the JVET**
**Professor, the UTokyo**



INSTA supported by IAEA Technical Cooperation Project tries to pave the way through active educators for developing tertiary students to be introduced to NST to ensure the sustainability of HR in the region.

Under this activity, we are happy to hold the Spring School in Japan to invite motivated international educators and share our experiences and knowledge with them on radiation protection especially focusing on NORM problem.

We would like to express much appreciation to the Government of Japan and in particular STIF and The University of Tokyo for supporting and hosting this event "TEWS2025JPN JPN".

We hope all the participants enjoy our event and feel limitless possibility on education diversity of radiation protection.

## The IAEA

**Ms Marina Binti MISHAR**

**Section Head and Programme Management Officer**
**Asia and the Pacific Section 2, Division for Asia and the Pacific, Department of Technical Cooperation, the IAEA**



Congratulations to the selected participants of the first INSTA School on Advanced Radiation Protection Focusing on NORM under Risk Management & Communication.

Hosted by the Government of Japan, with the support of JVET, The University of Tokyo, and NPO-STIF, this 11-day hybrid program provides a valuable opportunity to enhance your expertise in radiation protection and risk management.

The IAEA is proud to support the International Nuclear Science and Technology Academy (INSTA) and is committed to working together to ensure the success of INSTA schools. Motivating and empowering educators is crucial for sustaining human resources in harnessing the benefits of nuclear science and technology (NST), ensuring that the next generation is well-equipped to meet global challenges.

Wishing all participants a productive and collaborative experience.

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## 1. GENERAL INTRODUCTION

As one of the INSTA's missions primarily focuses on the advanced Radiation Protection (RP), the TEWS2025JPN 'RP NORM' was organised by the JVET in association with the UTokyo and the STIF respectively on 3rd -28th March 2025. The virtual programme was held for 5 days as of the remote mode and 6 days of on-site basis. 17 systematic lectures, 4 scientific facility/laboratory-visits to the Japan Chemical Analysis Centre (JCAC), the MALT-UTokyo – Micro Analysis Laboratory, Tandem accelerator, one of the accelerators of the UTokyo, both police and fire stations, and discussions among participants served as core training modules. TEWS2025JPN strengthened RP and NORM under its risk management & communication framework.

It is noted that, following TEPCO Fukushima Daiichi Nuclear Power Plant (FDNPP) accident in March 2011, a RP approach has been drastically developed; 'What the real RP status in Japan is and what the discussion point should be shared with the tertiary educators as the international stakeholders' was one of the ultimate goals of the programme. Through the INSTA TEWS2025JPN Spring School in Japan, ongoing researches, developing ways of teaching methods and tools provided by the JVET pertaining to optimisation of radiation safety management were widely shared with the participants in the Asia-Pacific region.

Moreover, NORM is one of the essentially discussed targets in the latest radiation protection scope owing to its complexity. The JVET through Prof. Iimoto – a Coordinator of the JVET – has just started a new official project named as 'Development of Risk Literacy Pedagogy Focusing on Trans-scientific Issues of Naturally Occurring Radioactive Materials' under the Japanese KAKENHI Project from October 2023 to March 2026, in which participants join a new research activity and enjoy its fruits.

With the background, the training tools were designed and developed with RP and NORM for the INSTA Spring School in Japan. With cutting-edge and diverse fields of study for RP/NORM, the keywords of 'radiation basics (such as biology, physics, chemistry, epidemiology, units)', 'safety and security', 'risk management and communication', 'radiation measurements', 'dosimetry', 'dose analysis and environmental monitoring', 'radiation protection system and three exposure situations', 'management of radioactive wastes and NORM' were provided in the TEWS2025JPN. In the meantime, the technical tours to the JCAC provided practical and skilful experiences on the environmental monitoring strategies in Japan; sample preparation & analysis, dose calculation and database formulation of radioactive materials; high quality precision control providing standards; and on-site training opportunities for stable isotopes. The site-visits to the MALT aimed to share the UTokyo's historical and practical experience-based knowledges regarding accelerator. Also, another visit to the police and fire stations provided Japan's measures towards accidental and safety management.

## 2. PARTICIPANTS, LECTURERS AND THE ORGANISER

### 2.1 PARTICIPANTS

12 participants (6 males and 6 females) from 10 countries joined the TEWS2025JPN. All were tertiary-level educators and researchers in Asia and the Pacific region. The below Table 1 presents the name, country and their affiliations.

Table 1: Participants' list with their countries and affiliations

| Participants name | Country | Affiliation |
|---|---|---|
| Ms. Nadia Babaei Bidmeshki | Iran  | Nuclear Science and Technology Research Institute |

| | | |
|---|---|---|
| Ms. Kafa Alderbass | Iraq  | Iraqi Atomic Energy Commission |
| Mr. Mahmoud Abo Qamar | Jordan  | Ministry of Education, Jordan |
| Ms. Maram Ahmed Radwan Al-Jarrah | Jordan  | Jordan Atomic Energy Commission |
| Mr. Khairul Anuar Bin Abdullah | Malaysia  | Ministry of Health, Malaysia |
| Mr. Bal Vikram Khatri | Nepal  | Amrit Campus, Tribhuvan University |
| Ms. Attia Rehman | Pakistan  | Senior Scientific Officer, Pakistan Nuclear Regulatory Authority (PNRA) |
| Mr. Saeed Ahmed Almalki | Saudi Arabia  | King Abdulaziz City for Science and Technology (KACST) |
| Ms. Gangani Sakunthala Wijesooriya Wijesooriya Mudiyanselage | Sri Lanka  | Sri Lanka Atomic Energy Board (SLAEB) |
| Mr. Alaa Algashi | Syria  | Atomic Energy Commission of Syria (AECS) |
| Mr. Muhammad Hassan Obeid | Syria  | Atomic Energy commission of Syria (AECS) |
| Ms. Kwuanchanok Chansawang | Thailand  | Mahidol University |

## 2.2 The IAEA Officers and the IAEA Expert

Three of the IAEA experts joined on-site activities in TEWS2025JPN. Table 2 presents the list.

Table 2: The IAEA Officers and the IAEA Expert

| Name | Affiliation |
|---|---|
| Ms. Marina Binti Mishar | Asia and the Pacific Sectio 2,<br>Division for Asia and the Pacific,<br>Department of Technical Cooperation |
| Prof. Helena Zhivitskaya | Nuclear Knowledge Management Section,<br>Division of Planning, Information and<br>Knowledge Management |
| Assoc. Prof. Anita Abd Rahrman<br>(the IAEA Expert) | Universiti Putra Malaysia |

## 2.3 HOST TEAM MEMBERS

The local organising team includes members from IIMOTO laboratory, together with other staffs from the UTokyo and the STIF including the JEs.

Table 3: Team Japan members' names and affiliations

| Name | Affiliation |
|---|---|
| Prof. Dr. Takeshi Iimoto | Director, TEWS2025JPN<br>Coordinator of JVET<br>Professor, the UTokyo |
| Ms. Rieko Takaki | Secretariat, TEWS2025JPN<br>Secretariat, the JVET<br>Executive, the STIF |
| Dr. Masahiro Okura | Research Associate, IIMOTO Lab/ EHS, the UTokyo |
| Dr. Yu Igarashi | Project Assistant Professor, the UTokyo |
| Dr. Hiromi Koike | Project Assistant Professor, the UTokyo |
| Dr. Md. Mahamudul Hasan | JE Leader, Project researcher, the UTokyo |
| Ms. Hitomi Nakamura | Secretary, IIMOTO Lab/EHS, the UTokyo |
| Ms. Aya Yoshiyama | Secretary, IIMOTO Lab/EHS, the UTokyo |
| Ms. Satori Kukita | Technician IIMOTO Lab. EHS, the UTokyo |
| Mr. Qianhao Jin | JE Sub Leader, D3, IIMOTO Lab., GSFS, the UTokyo |
| Ms. Yu Cai | JE, D3, IIMOTO Lab., GSFS, the UTokyo |
| Mr. Changting Guh | JE, M2, IIMOTO Lab., GSFS, the UTokyo |
| Ms. Xueqing Wang | JE, M2, IIMOTO Lab., GSFS, the UTokyo |
| Mr. Hanting Li | JE,M1, IIMOTO Lab., GSFS, the UTokyo |
| Ms. Yifan Shi | JE, M1, IIMOTO Lab., GSFS, the UTokyo |
| Ms. Ziyue Wang | JE, M0, IIMOTO Lab., GSFS, the UTokyo |
| Ms. Fan Yiming | M0, IIMOTO Lab., GSFS, the UTokyo |
| Mr. Tadakuni Soejima | Secretariat, STIF |
| Ms. Haruka Morisaki | Secretariat assistant |
| Ms. Asheda Anwar Nancy | JE Supporter |

## 3. COURSE DESCRIPTION

### 3.1 SCHEDULE

The TEWS2025JPN was held both online and on-site in Tokyo. Starting from 3rd March 2025, online lectures were arranged with Zoom. The first 13 lectures were held online, whereas remaining 4 were in-person at the UTokyo. Also, the JEs were taking the lead for the online lectures through their coordination with the lecturers by summarising the lectures and listing important Q/A. Each lecture lasted for around 1.5 hours comprising lectures, Q/A and discussions amongst the lecturers, participants, and the JEs. Each of the JEs was also assigned for their daily reports. As illustrated in the Figure 3, Day 1 consisted of the opening ceremony and first two lectures, whereas Days 2-5 delivered three lectures on each day, on the one hand, tangible activities, on the other, were held on 21st - 28th March. On Day 6, the welcome reception was held at the UTokyo and followed presentations by each participant and discussion. Also, the day-long analytical training on PHITS, site visits, additional lectures and group presentations should be also highlighted. Furthermore, the official dinner was arranged on Day 9 when all participants had extensive discussions and international culture exchanges. The in-person activities completed with final presentations from the participants alongside the closing ceremony.

Figure 3: TEWS2025JPN Programme

| Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|
| 2 | 3 **DAY1**<br>(1) Opening ceremony<br>JVET<br>(2) Lecture<br>Prof. IIMOTO<br>(3) Lecture<br>Prof. EKHTIAR | 4 **DAY2**<br>(1) Lecture<br>Dr. SASAKI<br>(2) Lecture<br>Asst.Prof. AL-AZRI<br>(3) Lecture<br>Assoc. Prof. SAENGKAEW<br>Dr. PLOYKRACHANG | 5 **DAY3**<br>(1) Lecture<br>Prof. YASUDA<br>(2) Lecture<br>Dr. HASAN<br>(3) Lecture<br>Assoc.Prof. KHOO | 6 | 7<br>(1) 15:30-16:30<br>(2) 16:45-17:45<br>(3) 18:00-19:00<br>[JST] | 8 |
| 9 | 10 **DAY4**<br>(1) Lecture<br>Asst. Prof. IGARASHI<br>(2) Lecture<br>Prof. SAITO<br>(3) Lecture<br>Prof. IIMOTO | 11 **DAY5**<br>(1) Lecture<br>Dr. BELMONTE<br>(2) Lecture<br>Dr. SAKODA<br>(3)Test & closing for virtual<br>JVET | 12-19 | 20 **DAY X**<br>Arrival at Tokyo, Japan | 21 **DAY6**<br>**AM**<br>Welcome ceremony, Guidance, Response lecture<br>**PM**<br>Participant presentations (15min/participant) | 22 |
| 23 | 24 **DAY7**<br>**All**<br>Analytical understanding of radiation behavior -PHITS training<br>Dr. OGAWA | 25 **DAY8**<br>**All**<br>Site-Visit; JCAC for environmental monitoring | 26 **DAY9**<br>**AM**<br>Group discussion<br>**PM**<br>Site-Visit; Police/Fire sta.<br>Prof. IIMOTO | 27 **DAY10**<br>**AM**<br>Risk Management<br>Assc.Prof. RAHMAN<br>Prof. HAYASHI<br>**PM**<br>Asst. Prof. SHUHARA<br>Group discussion & task, Site-Visit; MALT<br>Prof. MATSUZAKI | 28 **DAY11**<br>**AM**<br>Group presentations (20min/group)<br>**PM**<br>UTokyo/JVET presentations and Closing ceremony | 29 **DAY Y**<br>Leaving Japan |

Figure 3: Schedule for online and on-site activities during the TEWS2025JPN program

### 3.2 ONLINE EXAM

Aligning with the content of each lecture, an online examination was organised for the participants. On Day 1, the Participants took the examination to evaluate their knowledge on the School's NORM-centred topics. The examination ultimately aimed to ascertain the effective knowledges through the TEWS2025JPN to induce huge knowledge and skills on the TEWS2025JPN's RP and NORM for the participants. The examination happened three times: just before the first lecture on Day 1, Day 5 when the online sessions were finalised, and on Day 10. The chronological performances for HRD under the TEWS2025JPN was evaluated effectively. The examination is provided in APPENDIX-A.

## 3.3 TEWS2025JPN: ONLINE PROGRAM

### 3.3.1 OPENING CEREMONY

On 3rd March, the virtual Opening Ceremony of the INSTA Spring School 2025 was organised. The opening declaration was made by Ms. Rieko Takaki – the Secretariat of TEWS2025JPN in association with Dr. Md. Mahamudul Hasan. The welcome speeches were provided by Prof. Nobuhito Saito – the Executive Vice-President of the UTokyo.

**Prof. Nobuhito Saito**
Executive Vice-President, the UTokyo



Everyone. Welcome to The University of Tokyo, Japan.
I am Nobuhito SAITO, Executive Vice President in charge of Environment, Health and Safety of The University of Tokyo.
Our workshop, "INSTA Spring School of Advanced Radiation Protection Focusing on NORM under Risk Management & Communication", has just started in remote mode. This workshop, as the spring school of INSTA, International Nuclear Science and Technology Academy, is officially one of the regional activities supported by the International Atomic Energy Agency. INSTA aims to improve nuclear science and technology literacy in each country of the Asia-Pacific region and to train professors, educators or instructors, who will be strong and attractive leaders of tertiary education in the world.
As you know, Professor IIMOTO of our university is hosting this workshop based on the Japanese experience of high-level nuclear science and technology. His specialty is radiation protection, so the main topic of this workshop is "Advanced Radiation Protection Focusing on NORM under Risk Management & Communication". NORM is naturally occurring radioactive material. So far, Professor IIMOTO has organized the Japanese volunteer's Expert Team, called JVET, and he has taken the lead in the various regional technical cooperation programs of the IAEA. The activities of JVET under the leadership of Professor IIMOTO have been highly appreciated not only by the IAEA, but also by related ministries and agencies of Japan, such as MOFA, Ministry of Foreign Affairs, and MEXT, Ministry of Education, Culture, Sports, Science and Technology. We are really proud of this, and please enjoy this workshop planned and supported by JVET. I hope that through our workshop, many talented educators with a balanced mind and sense will develop in the Asia-Pacific region. And I wish you success and great achievements.
Thank you for your attention.

Finally, Professor IIMOTO shared the purpose and guidelines for the courses. All participants, many of the lecturers, team Japan, and experts from the IAEA joined the opening ceremony.

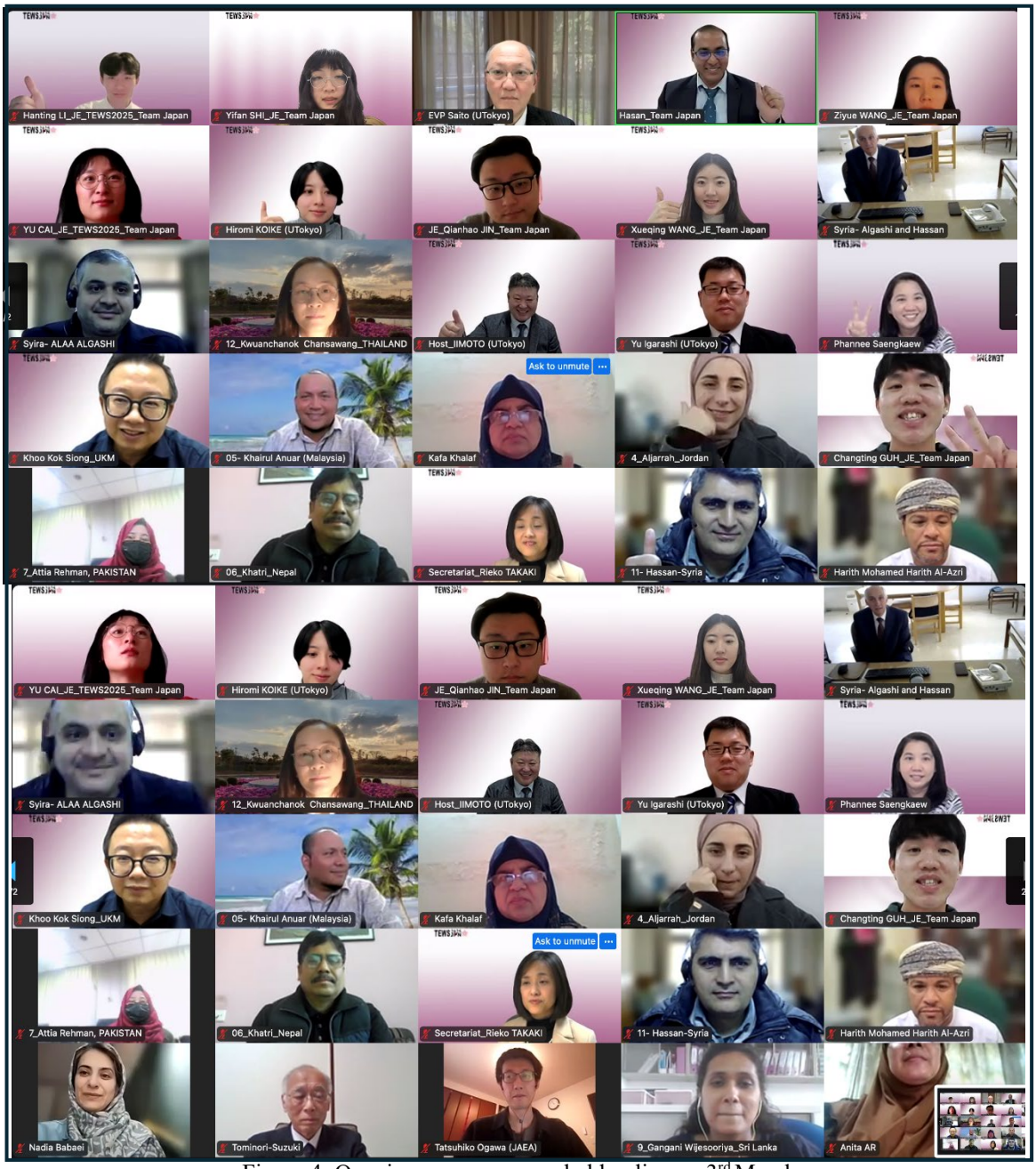
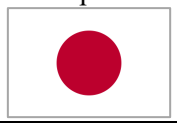
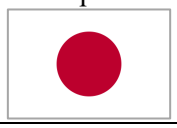
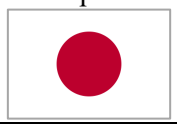


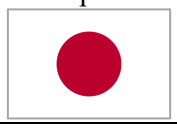
Figure 4: Opening ceremony was held online on 3rd March

### 3.3.2 ONLINE LECTURES

13 lectures from diverse perspectives of RP/NORM were provided for approximately one hour. All lecturers are experts in the respective fields meeting the quality assurance: information on the virtual lecturers is given in the Table 4. Around 45 minutes were allotted for delivering the lectures and 15 minutes for Q/A and discussions. The lecturers were from 7 countries, providing cutting-edge lectures to the participants. This idea on consistency of internationality for recruitment of lecturers was the heart of the INSTA Spring School as well as its international cooperative activities ever since and future.

Table 4: List of lecturers with their affiliations and lecture themes

| Name | Country | Affiliation/lecture theme |
|---|---|---|
| Prof. Dr. Takeshi Iimoto | Japan  | The University of Tokyo (UTokyo)<br>Theme: RP Scope and World –<br>its infinite possibility as an education theme<br>[lecture no. 1] |
| Prof. Adnan Ekhtiar | Syria  | Atomic Energy Commission of Syria (AECS)<br>Radiobiology<br>[lecture no. 2] |
| Dr. Michiya Sasaki | Japan  | Central Research Institute of Electric Power Industry<br>Radiation epidemiology<br>[lecture no. 3] |
| Asst Prof. Harith M. Al-Azri | Oman  | University of Nizwa<br>Nuclear physics, radiation physics and chemistry<br>[lecture no. 4] |
| Assoc. Prof.<br>Dr. Phannee Saengkaew<br>Dr. Kamontip Ploykrachang | Thailand  | Chulalongkorn University<br>Radiation measurements<br>[lecture no. 5] |
| Prof. Dr. Hiroshi Yasuda | Japan  | Hiroshima University<br>Radiation units<br>[lecture no. 6] |
| Dr. Md Mahamudul Hasan | Bangladesh  | The University of Tokyo (UTokyo)<br>Dosimetry and Dose estimation<br>[lecture no. 7] |
| Assoc. Prof. Kok Siong Khoo | Malaysia  | National University of Malaysia<br>RP in Safety and Security<br>[lecture no. 8] |
| Asst Prof. Dr. Yu Igarashi | Japan  | The University of Tokyo (UTokyo)<br>RP in planned and emergency exposure situation<br>[lecture no. 9] |
| Prof. Dr. Takumi Saito | Japan  | The University of Tokyo (UTokyo)<br>RP for radioactive wastes<br>[lecture no. 10] |

| | | |
|---|---|---|
| Prof. Dr. Takeshi Iimoto | Japan  | The University of Tokyo (UTokyo)<br>RP in existing exposure situation<br>[lecture no. 11] |
| Asst Prof. Dr. Zachariah John Belmonte | Philippines  | Technological University of the Philippines<br>Risk communication in RP<br>[lecture no. 12] |
| Dr. Akihiro Sakoda | Japan  | The Japan Atomic Energy Agency (JAEA)<br>RP for NORM<br>[lecture no. 13] |

### 3.3.3 RESULTS FROM THE ONLINE LECTURES: CONTENTS, Q/A, DISCUSSIONS, OPINIONS FOCUSING ON JUNUIOR EXPERTS' VIEWPOINTS

The TEWS2025JPN's online lecture modules included presentations and interactive discussion sessions among the lecturers, the participants, the JEs and other the local organising members. The JEs checked the attendance during each lecture. With their notes and video records of the lectures, they summarised each lecture's information (content, Q/A and discussions). All JEs are graduate young experts in RP/NORM; a section of their opinions regarding the lecture discussion has been added in the daily report. With the sections, a new reflection from young experts has been highlighted for each of the online training modules. The JEs' daily reports are the key best practice of the online programme as the organising team. This framework has also played an essential role in running HRD for young generations who are involved in this mission. See JE's report contents inserted into the APPENDIX-B.



Figure 5: TEWS2025JPN training started with Prof. IIMOTO's lecture on RP scope and world

## 3.4 TEWS2025JPN: ON-SITE PROGRAM IN JAPAN

### 3.4.1 WELCOME CEREMONY AND SPEECHES

On-site activities started from March 21st by inaugurating the welcome ceremony at the UTokyo. All participants, local organising team members, guests from the UTokyo, STIF, the MOFA and the MEXT joined the welcome ceremony. After the welcome speeches from the guests, Prof. Iimoto, on behalf of organiser, provided introductory and guidance presentations to the participant at the Administration Bureau Building, 12th Floor, the UTokyo.

**Prof. Toshiharu Kishi**
Executive Director, Vice-President
Director General,
Division for Environment, Health and Safety, the UTokyo



Everyone. Welcome to Japan, to Tokyo, and to The University of Tokyo. I am Toshiharu, KISHI, Executive Director and Vice President, and also Director General of the Environment, Health and Safety Division of The University of Tokyo.
"INSTA Spring School of Advanced Radiation Protection Focusing on NORM under Risk Management & Communication" has just started in on-site mode, here in Tokyo. This is the time of transition from winter to spring in Japan. I am very happy that we could invite you to our university in early spring, when the air is really fresh and beautiful flowers such as Japanese plums and cherry blossoms are gradually blooming.
This time, we are hosting 12 participants from 10 countries in the Asia-Pacific region selected by the INSTA Steering Committee; Iran, Iraq, Jordan, Malaysia, Nepal, Pakistan, Saudi Arabia, Sri Lanka, Syria, and Thailand.
In every country, it is important to promote basic science and technology literacy. I believe that education based on STEAM, Science and Technology, Engineering, Art, and Math, for students will be a powerful key. From the perspective of human resource development, the STEAM approach with the "WOW factor" is really important. In Japan, the Fukushima nuclear disaster occurred in 2011, and radiation risk and safety literacy has become one of the most important topics in education. I hope that all participants in this workshop will gain high level knowledge and experience on radiation risk and safety from our professors and experts. In addition, I hope that through this workshop, many talented trainers with a balanced mind and sense will develop in the Asia-Pacific region. I wish you success and great achievements.
Finally, I would like everyone to take this opportunity to enjoy Japanese culture, atmosphere and food. There are many historical sites and places of interest around The University of Tokyo. I believe all of you can manage your time and activities even in the month of Ramadan. I hope you will enjoy and feel Japan.

Thank you for your attention.

**Mr. Kenichiro Tanaka**
Director
International Nuclear Cooperation Division, Disarmament,
Non-Proliferation and Science Department, the MOFA



Everyone. My name is Kenichiro TANAKA, Director, International Nuclear Cooperation Division, Disarmament, Non-Proliferation and Science Department, Ministry of Foreign Affairs, MOFA.

As a strong supporter of the IAEA and its international activities, we are very pleased to have this spring school of INSTA on regional cooperation in Japan. On behalf of the MOFA, I would like to express our sincere appreciation to the INSTA steering committee, IAEA, the local host institutes, namely, Science and Technology Information Forum and The University of Tokyo for its strenuous efforts to organize this event. Particular compliments go to the team of Japanese and international professors and experts led by the course director, Professor IIMOTO for their hard work to make this event happen. I would also like to extend our heartfelt welcome to the distinguished participants from the Asia-Pacific region.

Japan has attached great importance to promoting the peaceful uses of nuclear science and technology, and accordingly has long supported the IAEA both financially and in personnel in its endeavor to carry out relevant activities in this regard. As you may agree, we face quite a few socio-economic development challenges in this fast-changing world, as identified in the Sustainable Development Goals or SDGs. I am pleased to note that the IAEA identifies many goals of SDGs as areas to which the Agency can contribute by using nuclear science and technology. Japan highly values the IAEA's efforts to promote peaceful use of nuclear technology in achieving the SDGs especially in health, agriculture, energy and the environment. Such an important role that NST can play in tackling our common challenges should be duly acknowledged and further informed to the general public.

At the same time, we should be reminded that it is important to ensure radiation protection and nuclear safety. We should be once again aware of the importance of enhancing the general public's understanding of radiation protection and safety, including the understanding of all stages of students at school, who are introduced to NST.

This spring school under the activity of INSTA seems to offer multiple merits. The participants from the field of education will be able to learn diverse aspects of radiation protection and safety including risk communication, while improving the NST literacy in general.

I sincerely hope that the school will turn out to be most useful and productive, thereby enabling all the participants of the school to be star professors or instructors who would share with other experts as well as students the latest knowledge and skills on NST in their own countries as well as throughout the region.

I hope you have great success. Thank you for your attention.

**Mr. Taku Kawahara**
Director International Nuclear Cooperation, Research and Development Bureau, the MEXT



Everyone. My name is Taku KAWAHARA, Director, International Nuclear Cooperation, Research and Development Bureau, Ministry of Education, Culture, Sports, Science and Technology, MEXT. It is my great honor to have been given this opportunity to deliver an opening speech in this school. First of all, I would like to give a hearty welcome to all the participants and to express my deep gratitude to The University of Tokyo for providing their facilities for this school. I would also like to thank all the lecturers and supporting staff from the related organizations as well as INSTA and IAEA for their enormous efforts. I have heard that Japan's Team led by Professor IIMOTO has contributed to realizing better qualification in radiation education in the Asia-Pacific region by means of providing Japanese knowledge, technology and tools mainly through the IAEA Technical Cooperation Programme. I believe this school will provide a wonderful opportunity for participants to obtain deeper knowledge on the latest cases in order to establish a sustainable framework of radiation education in higher education in the Asian-Pacific region. I greatly anticipate that regional cooperation in nuclear science and technology education will be developed in order to strengthen the next generation of human resources, and that such new generations will be able to enhance the power of nuclear science and technology education in order to realize the Sustainable Development Goals, SDGs.

Our Ministry, MEXT, has promoted several sustainable international programs for effective cooperation for peaceful use of nuclear technology in Asian countries. MEXT highly evaluates and supports these kinds of international collaborative activities related to such nuclear science and technology education, and we will continue to support such efforts as much as possible.

Finally, I hope that this school will serve to provide both the participants and the lecturers with the opportunity to learn a lot from the outcomes, and I wish all the participants continued success and prosperity in the future.

Thank you for your kind attention.



**Prof. Iimoto** shared in detail the modules ofs TEWS2025JPN amongst all participants during the welcome ceremony. Starting with the explanation of the INSTA educational schemes, TEWS and the JVET's organisation, he elaborated daily activities as of the onsite activities. As the programme director, the background, scope and aims of radiation protection and NORM under the framework of TEWS2025JPN were emphasised during his warm welcome speech.




Figure 6: The INSTA TEWS explanation and guidance provided by Prof. Iimoto at the welcome ceremony



Figure 7: All TEWS2025JPN participants and organising members joining the welcome ceremony were in front of the administrative building at the UTokyo on March 21st 2025

### 3.4.2 REPORTING NORM STATUS OF EACH COUNTRY- PRESENTATIONS BY PARTICIPANTS:

Having the afternoon session on Day 6 thanks to Prof. Iimoto's lecture – the Japanese experiences-oriented session regarding the management of RP/NORM, he shared the task to be achieved by group work, making 4 groups containing three participants on the 'future NORM lecture model'. Each of participant, subsequently, shared their backgrounds and perspectives on their country's NORM status.

As per the guidance the previously recommended on the activities and tasks, each participant made presentations in the afternoon session of Day 6.

The session consisted of presentations from all participants, entitled 'NORM status in the participant country'. The following are the requirements, which were delivered by the JVET.

- ✓ Each participant shall make an 8-10 minutes-running presentations (within max 15 min. including Q&A), which must be prepared before arrival at Tokyo on March 20.
- ✓ Each presentation shall follow the format of the attached PPT named 'NORM status in Japan_IIIMOTO (UTokyo)_March 21, PM', which will be used in the first presentation by Prof. Iimoto (Japan) at 12:45-13:00.
- ✓ Each presentation shall include 4 contents of 'Self-introduction', 'Natural Radiation and Radioactivity in the participant's country', 'Example topic in the participant's country', and 'Regulation and guides of NORM in the participant's country'.
- ✓ If multiple participants attended from one country, they must make sure that presentations will be run one by one.

[Presentation Schedule and Order]
12:45-13:00; Local Organiser, Takeshi Iimoto, Japan
13:00-13:15; 1. Nadia Babaei Bidmeshki, Iran
13:15-13:30; 2. Kafa Alderbass, Iraq
13:30-13:45; 3. Mahmoud Abo Qamar, Jordan
<Break>
14:00-14:15; 4. Maram Ahmed Radwan Al-Jarrah, Jordan
14:15-14:30; 5. Khairul Anuar Bin Abdullah, Malaysia
14:30-14:45; 6. Bal Vikram Khatri, Nepal
<Break>
16:00-16:15; 7. Attia Rehman, Pakistan
16:15-16:30; 8. Saeed Ahmed Almalki, Saudi Arabia
16:30-16:45; 9. Gangani Sakunthala Wijesooriya Wijesooriya Mudiyanselage, Sri Lanka
16:45-17:00; 10. Alaa Algashi, Syria
17:00-17:15; 11. Muhammad Hassan Obeid, Syria
17:30-17:30; 12. Kwuanchanok Chansawang, Thailand



Figure 8: Afternoon session led by Prof. Iimoto – lectures & group work instructions



Figure 9: Participants presenting themselves and NORM status in their countries

### 3.4.3 ON-SITE LECTURES: PHITS

A whole-day training programme was organised by Dr. Ogawa on ‘Analytical understanding of radiation behaviour-PHITS training’. With the cooperation of the JEs, the PHITS software was previously installed on each participant’s personal computers. In the first session, Dr. Ogawa provided a lecture on the basics of PHITS with the title of Analytical Understanding of Radiation Behaviour. With the basic discussion of the basics and application leading to the PHIITS, hands-on exercises of PHITS were demonstrated to the participants. JE’s report on this lecture, attached in APPENDIX, provided the main content and discussion of this lecture based on PHITS.




Figure 10: A day-long lecture course on PHITS by Dr. Ogawa

### 3.4.4 VISITS: JAPAN CHEMICAL ANALYSIS CENTER (JCAC)

The TEWS2025JPN team visited the JCAC, which is located in Chiba, 40 kilometres ahead from Tokyo. The Team visited by bus on Day 8's site visits for observing Japan's one of the best arrangements for environmental monitoring, along with practical experiences. Dr. Ohta provided a lecture on the environmental radioactivity monitoring in the JCAC following Japanese experiences, focusing on the JCAC information and activities, analysis methods of radioactive nuclides, database, standards of methods, quality assurance and educational and training approaches. Then, the participants received a holistic approach to radioactivity/radionuclide measurement across Japan. Regarding the NORM management approaches by the JCAC, a case study of elevated levels of radioactivity in the steel pipe scrape was addressed, which was one of the joint projects of IIMOTO Laboratory.

After the lecture, the participants, while dividing into two groups, joined the facility visits. Among the facility visits, the target samples preparation procedure (i.e. fish) was shown as one of the systematic and unique advantages. The measurement and sophisticated analytical techniques of radioactivity measurement with very special features of very low detection were then presented to the participants. These gamma-ray measurement, Strontium, Tritium, and Plutonium measurement techniques were remarkable as well as hands-on experiences and practical experiences were provided with direct measurement on the elevated NORM-enriched samples collected from human-used materials in Japan. As for the collection of airborne dust, a unique high-volume air sampler named Snow White was presented. It retains a high sensitivity analysis in $\mu Bqm^{-3}$ ranges. Overall, the site visits brought about a new perspective on NORM and artificial source enriched chemical/radioactivity analysis based systematic and unique experiences, Japanese policy on handling radioactivity measurement across Japan, and hands-on practical experiences among the TEWS2025JPN participants.

The JCAC site visits formulated a profound understanding of NORM/radiation protection as the participants obtained a significant increase in accuracy rate during the third test, which was implemented after this tour (please visit the relevant section regarding the test results).

Table 5: JCAC's visits overview

| | |
|---|---|
| **Analysis and Measurement** | ◆Analysis/measurement of environmental radioactivity<br>① **Analysis of radioactive nuclides**<br>・Measurement by Ge semiconductor detector : gamma-ray emission nuclides<br>・Radiochemical analysis : Tritium, Carbon-14, Strontium-89/90,<br>Iodine-129, Radium-226, Polonium-210,<br>Thorium, Uranium, Plutonium, Americium , Curium<br>・Trace Element Analysis (ICP-MS) : Uranium, Thorium, Plutonium<br>・Radioactive Noble Gas Analysis : Krypton-85,Xenon-131m,133,133m,135<br>② **Dose measurement (air radiation dose rate)**<br>③ **Collecting and managing data**<br>Operation and management of Environmental Radiation Database<br>" Environmental Radioactivity and Radiation in Japan" |
| **Precision Control** | ◆Intercomparison analysis ◆Proficiency testing<br>◆Calibration of radiation measuring instruments<br>◆Providing standard sample |
| **Education and Training** | ◆Environmental radioactivity analysis/measurement training<br>①**Training for prefectural monitoring organizations**<br>②**Training for general institutions**<br>◆Stable isotope analysis training ◆Contract training ◆On-site training |



Figure 11: TEWS2025JPN members with the JCAC members at the JCAC entrance



Figure 12: Participants receiving lectures concerning environmental radioactivity and monitoring at JCAC


Figure 13: Participants receiving hands-on experiences with unique instrumental approaches by the JCAC staffs

### 3.4.5 VISITS: POLICE AND FIRE STATION IN TOKYO

On Day 9, the TEWS2025JPN organised the visits to both police and fire stations and received practical experiences on the management of safety and security.




Figure 14: TEWS2025JPN participants at Fire and Police stations located in Bunkyo, Tokyo

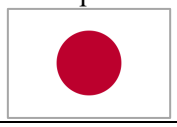
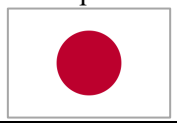
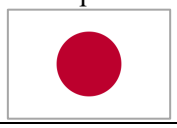
### 3.4.6 ON-SITE LECTURES AT THE UNIVERSITY OF TOKYO: RISK MANAGEMENT

On Day 10, the *in-situ* lectures focusing on the risk estimations from the viewpoint of medical risk, chemical risk, and general risk were provided by Assoc. Prof. Rahman, Prof. Hayashi, and Asst. Prof. Shuhara, respectively (lectures no. 15-17). The details of the output have been attached to the APPENDIX-B through the JEs' reports.




Figure 15: TEWS2025JPN participants receiving risk management lectures from the viewpoint of medical, chemical and general risk at the UTokyo

Table 6: On-site lecturer's names, country and affiliations

| Name | Country | Affiliation/lecture theme |
|---|---|---|
| Dr. Tatsuhiko Ogawa | Japan  | The Japan Atomic Energy Agency (JAEA)<br>Analytical understanding of radiation behaviour PHITS training<br>[lecture no. 14] |
| Assoc. Prof. Dr. Anita Abd Rahman | Malaysia  | Universiti Putra Malaysia (UPM)<br>Integration of thinking with other disciplines related to risk management:<br>Medical Risk<br>[lecture no. 15] |
| Prof. Dr. Rumiko Hayashi | Japan  | Tohoku University<br>Integration of thinking with other disciplines related to risk management:<br>Chemical Risk<br>[lecture no. 16] |
| Asst Prof. Dr. Ai Shuhara | Japan  | The University of Tokyo (UTokyo)<br>Integration of thinking with other disciplines related to risk management:<br>General Risk<br>[lecture no. 17] |

### 3.4.7 FACILITY VISIT: MALT, THE UNIVERSITY OF TOKYO

The TEWS2025JPN members visited MALT facility at the UTokyo:

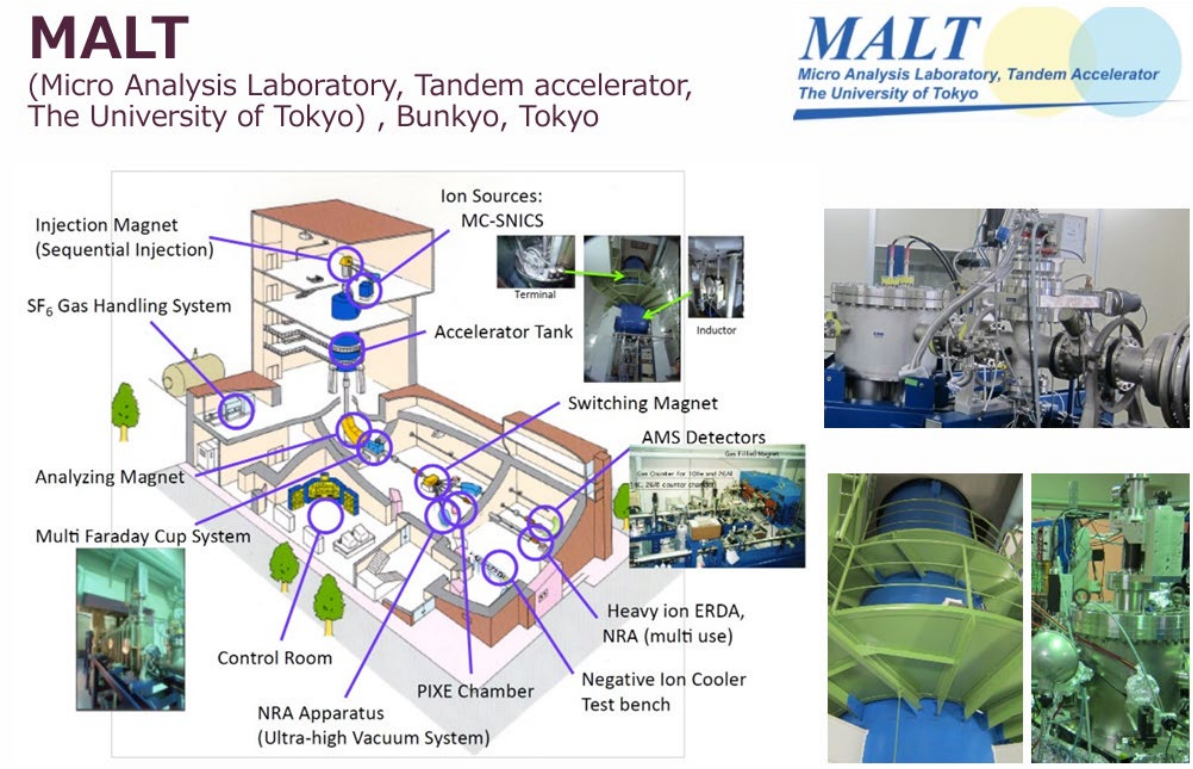



Figure 16: Overview of MALT facility at The University of Tokyo




Figure 17: TEWS2025JPN participants visited MALT accelerator facility at The University of Tokyo

## 3.5 GROUP PRESENTATIONS AND CLOSING CEREMONY

### 3.5.1 GENERAL DESCRIPTION

Day 11 was the last day of TEWS2025JPN programme on which the group tasks, as per the guidance on the 1st day, were reported by the participants. Apart from the TEWS2025JPN participants' presentations, certain special lectures were given by the IIMOTO laboratory members. Based on the participants performance, through the voting by team Japan, Most Valuable Participant (MVP) was selected for the TEWS2025JPN programme. The criteria were based on pre-participation preparation, attendance and active participation from Day 1 to Day 11, Day-6, presentations, Day-7 PHITS efforts, active participation in Day-8-10 facility tours, Day-11 group presentations and their contributions, including discussions and other cooperation and collaboration in the overall activity.

Based on the performances throughout the Courses, Ms. Nadia Babaei Bidmeshki, was selected as the MVP for TEWS2025JPN programme.




Figure 18: Group presentations given by the participants during the last day of the on-site programme



Figure 19: Special lectures on NORM/radiation protection by UTokyo Ph.Ds among final day participants




Figure 20: Closing ceremony



Figure 21: Members at the closing ceremony at The University of Tokyo




Figure 22: MVP prize and certificates given by TEWS2025JPN director and secretary, to MVP Ms. Nadia and other participants

### 3.5.2 GROUP PRESENTATIONS ON DAY 11

**GROUP A**

Group A, consisting of three members (listed below) of the TEWS2025JPN participants, investigated and presented the 'future NORM lecture model'. They aimed to ascertain the 4 issues throughout the presentations as of pointing to increase the awareness of the students about NORM and NST, providing a potential syllabus of a lecture/course on 'Radiation Protection' focusing on NORM under the risk management & communication considering STEAM track; highlighting actions to accomplish a high 'WOW factor'; and finally providing the selling points of the proposed lecture.

| Group A | | |
|---|---|---|
| Nadia Babaei Bidmeshki | F | Iran |
| Khairul Anuar Bin Abdullah | M | Malaysia |
| Muhammad Hassan Obeid | M | Syria |



Figure 23: GROUP A members presenting group presentation on Day 11 with the session Chair

The participants strengthened demographic and psychological characteristics student background, age, gender, personality as well as the NST literacy and course tools.

The presentation proposed a systematic syllabus that consists of:

- ✓ Introduction: ionizing radiation along with radiation units, which contained the definition, types, and characteristics of radiation, half-life, units of radioactivity and units of energy.
- ✓ Interaction of radiation with matter: how different kinds of ionizing radiation can lose with its energy in the matter.
- ✓ Dosimetry and dose estimation: explanation of operational and protection quantities, units, internal and external exposures.
- ✓ Sources of ionising radiation: incorporating the issues of NORM, TENORM, manmade sources, application of NST to our life, radiation protection-protective measure as of the safety management.
- ✓ Radiobiology: focusing on the direct effects, indirect effects, stochastic effects and deterministic effects.
- ✓ Radiation measurement: various types of radiation detectors, and internal and external exposures.
- ✓ Basics of radiation protection: this includes the principles and optimization procedure of RP, countermeasures to radiation exposure, exposure situation, monitoring, emerging technologies in radiation safety, and research opportunities in NORM and NST.
- ✓ Radioactive waste management: decontamination, waste storage and nuclear power plant waste treatment.
- ✓ Risk management and communication for radiation protection: risk, hazard identification, diverse aspects of risks.
- ✓ Regulation and safety: international and national guidelines (such as IAEA standards), Norm waste management.
- ✓ Hands-on and outreach activities.

The group participants also shared their concepts for a model 20-minute lecture with the framework described below:

- ✓ Introduction of NORM: it extended for 2 minutes, whose contents retained the NORM overview, sources, mainly from terrestrial radioactive sources, and NORM industries.
- ✓ Understanding the radiation risk extends for 2 minutes. Definition and types of radiation are of the main content. The key concepts are of dose, risk, and exposure. Comparison between natural and artificial radiation, monitoring, and case studies for mining and construction is a key aspect.
- ✓ Radiation protection strategy: time was for 4 minutes. It focuses on engineering controls, shielding and ventilation. Alternatively, the administrative control of training, policies, and procedures is included. Finally, the personal protective equipment and monitoring devices are strengthened.
- ✓ Risk management for NORM: the duration was 6 minutes. The risk identification is for assessing NORM exposure. Safety standards and regulations such as ICRP, WHO and EPA were addressed.
- ✓ Effective risk communication: the time was for 3 minutes. It adheres to communication to public and workers. Fear and misconceptions were emphasized in this part. Furthermore, stakeholder engagement was decided in the decision-making process.
- ✓ Conclusion: It prolonged for 2 minutes: whose the summary will be done through the importance of balanced approach for risk management and communication, along with providing the future directions and challenges for NORM radiation protection.

The presentation integrated STEAM into the lecture model by integrating the core principles of **S**cience (Radiation Biology), **T**echnology (Monitoring and Control Systems), **E**ngineering (Shielding Designs), **A**rts (Visual Communication Tools) and **M**athematics (Risk Assessment Models). Also, the demonstration for the interdisciplinary nature of modern radiation protection practices was added under the STEAM framework.

As the ‘WOW Factors’, the presenters highlighted introducing visuals that are potentially high-quality images and animations; hands-on activities of simple experiments or demos; and outreach activities, surprising factors of unexpected information, banana, flying, a hot spring, building materials, storytelling, interactive polls, and quizzes. Finally, as for the assessment of ‘WOW factor’, the participants recommended conducting the survey, asking students to rate the amusements and the morning engagement.

Under the SELLING POINT approaches, the presentation addressed about the usage of electricity for daily necessity, sharing the shortages, strengthening nuclear techniques as potential alternative option, learning previous disaster’s impact on alerting the scientists and advancing the laboratory facility similar with their TEWS2025JPN visits to the JCAC, where the detectors/measurement devices could detect the radioactivity with a very lower level of detection limit. The members of the group presentation addressed the approach by showcasing the elevated levels of the radiation exposure received during the medical compared to terrestrial, cosmic radiation, internal radiation exposure, and travel-related dose, which are some of the selling points of their lecture module on NORM. They addressed, then, the radioactivity level comparison for daily usage materials of cigarettes, building materials, hot springs, luminous wristwatches, smoke detectors, TV/computer screens with CRT technology, and radon exposure to the public.

Finally, the shared to clarify ‘we need NST BUT: We should take care’ as their conclusion.

## GROUP B

Group B started reporting by explaining the NORM status of the TEWS2025JPN three participants' countries, following the countrywide mining sites and mineral resources. As for the NORM lecture model, the presentation highlighted the basics of NORM, following its presence everywhere, clarifying the key isotopes, industry/mining-oriented generation, and geological-oriented features in presenting NORM basics. Later, they illustrated different NORM exposure pathways, which were classified under industrial sources, environmental transfer, and associated human exposure. Mining, industry, air dynamics, contamination of natural resources of air/water/soil and food, human physiological & environmental dynamics-based sources were among the lecture's ways of pathways. Under the health risk and radiation protection theme, the participants of Group B presented the ALARA principle as part of the protection protocols, systematic evaluation of exposure likelihood & consequences for risk assessment, general exposure factors, and biological effects. Then, as the risk management strategy module, they highlighted the engineering control, monitoring programme and regulatory compliance in their presentation.

| Group B | | |
|---|---|---|
| Kafa Alderbass | F | Iraq |
| Bal Vikram Khatri | M | Nepal |
| Alaa Algashi | M | Syria |



Figure 24: GROUP B members presenting group presentation on Day 11

The future perspective in the NORM management was described as below:

- ✓ Current status: monitoring protocols and basic regulatory framework across industries.
- ✓ Near future: It is a 5-year plan. AI-powered detection systems and harmonized international regulations.
- ✓ Medium term: it's a 10-year duration plan. integrated exposure tracking thought he industries and automated remediation technologies.
- ✓ Long term: it's a 20-year+ plan dealing with complete life-cycle management of NORM and zero-waste processing technologies.

The presentation later proposed steps of empowering the future professionals by applying 4 steps: scientific foundation-understanding the core of physical and biological sciences for radiation effects oriented decision making; practical competence-hands on skills for measurement and protection for workplace; lifelong learning-continuation education with science and regulation; and finally, global perspective- strengthening international collaborations tackling NORM challenges across borders and industries.

Finally, as for the development risk literacy of the university students based on the NORM, the group presentation proposed to focus on student's daily and surrounding lifestyles, what they see about the energy around them, considering the sources of energy and usage of electricity in their daily life. The students should think about alternative sources of conventional energy (i.e. coal and oil) rather than focusing on some sustainable, environment-friendly approaches, such as teaching materials, which could be addressed as the 'WOW factor', according to this presentation.

## GROUP C

Group C proposed a model lecture programme with the objectives of understanding the fundamentals of radiation and radioactivity, in-depth knowledge about NORM basic, local, and international radiation protection standards, development of practical risk management/communication tools, and finally, analysing real-world case studies. As the target audience, STEAM secondary- and tertiary- students were focused. The duration was designed for one week, consisting of three modules. Moreover, the group presentation showed an alternative way to start a program: to start the programme with a banana, ask the participate to eat, then show them EPA evidence with 0.1 µSv of the exposure just they have eaten from the banana individually, finally assuring them with 'don't worry-you are not going to have cancer … it's completely safe'; they addressed this way to introduce radiation/NORM/NST education programme to the students.

| Group C | | |
|---|---|---|
| Mahmoud Abo Qamar | M | Jordan |
| Attia Rehman | F | Pakistan |
| Gangani Sakunthala Wijesooriya Wijesooriya Mudiyanselage | F | Sri Lanka |



Figure 25: GROUP C members presenting group presentation on Day 11

The designed modules are described below-

Module 1: Introduction to radiation

- ✓ Lecture-1: Basic of atoms/matter, radioactivity, types of ionizing radiation.
- ✓ Lecture-2: Interaction with matter, units, and biological effects of radiation.
- ✓ Lecture-3: Monitoring/detection techniques with common radiation detector.
- ✓ Lecture-4: Radiation protection standard, international (such as the IAEA & the ICRP) and local.
- ✓ Lecture-5: Application (medical and industrial).
- ☐ As the 'WOW Factor', activity-1: measuring background radiation with Geiger-Muller counter and comparing with different locations was addressed.

Module 2: Understanding NORM

- ✓ Lecture-6: Introduction, presence of NORM and radiation exposure pathways.
- ✓ Lecture-7: Terrestrial radionuclide series, NORM in mining industry and TENORM.
- ✓ Lecture-8: Environmental monitoring of basic radiation types.
- ✓ Lecture-9: facility visit.
- ☐ As the 'WOW factor', activity-2: case studies on hot spring; and activity-3: identification of radiation tracks by cloud chamber were proposed.

Module 3: Risk management and risk communication

- ✓ Lecture-10: Radiation risk- qualitative/quantitative risks, dose-response relationship, dose calculation and risk estimation, comparison of radiation risks with other environmental risks.
- ✓ Lecture-11: Risk communication-importance, challenges, psychological & social factors.
- ✓ Lecture-12: Radiation emergency preparedness and response-types, strategies.
- ☐ 'WOW Factor', activity-4: Case studies from real scenarios of Fukushima and Chernobyl; activity-5: poster presentation to public awareness based on learned lessons through lectures.

Finally, as the selling points of the lecture model, fundamental/basic knowledge, real case studies, and hands-on practices were included, through which students can learn about laws and systematic procedures implementing the compliance strategies.

## GROUP D

As for the future NORM lecture model, Group D proposed a lecture syllabus to bridge science and society under the framework of NORM, radiation protection and awareness. The ultimate duration is 3 hours and 30 minutes. The target audience is the undergraduate students majoring in Engineering, Physics, Environmental Science and Health Physics. The track framework is STEAM. Overall, the lecture would explore NORM and its associated impact on radiation protection. The student could learn about real-world case studies and interactive activities that can connect risk management with risk communication. Finally, through scientific analysis, technological solutions and communication strategies, the course would ascertain public awareness and policy-making approaches for radiation protection. Finally, through this course, the students are taught to teach with the identification of NORM sources, explain radiation protection principles, analyse NORM-based issues along with associated risk management strategies, and finally, demonstrate effective risk communication techniques for public understanding.

| Group D | | |
|---|---|---|
| Maram Ahmed Radwan Al-Jarrah | F | Jordan |
| Saeed Ahmed Almalki | M | Saudi Arabia |
| Kwuanchanok Chansawang | F | Thailand |



Figure 26: GROUP D members presenting group presentation on Day 11

The lecture module is designed as follows-

Part-1: Introduction-Radiation all around us (45 mins)

- ✓ Topics: Basic of radiation, NORM (i.e. sources & daily life) and exposure.
- ✓ STEAM focus: Scientific issues-radioactive decay, exposure levels and biological effects, quick interactive poll: 'which source do you think gives you the highest radiation exposure', visual comparison-radiation doses from daily life along with industry & Fukushima.

Part-2: Radiation protection (45 mins)

- ✓ Topics: ALARA principles, concepts of doses, types of exposure and monitoring systems.
- ✓ STEAM focus: Engineering-shielding materials; technology-radiation monitoring devices.
- ✓ Interactive element: demonstration-hand on use of radiation detectors.

Part-3: Case study and discussion (1 hour)

- ✓ Topics: Case study-radioactive beach (Guarapari & Brazil) and Fukushima, crisis communication-comparative lessons from Fukushima and NORM industry responses, real-world incidents: NORM exposure & miscommunication, lessons learned-successful vs failed risk communication strategies.
- ✓ STEAM focus: Science & communication-simplifying radiation data for public understanding, Mathematics-risk probability estimation in public reports.
- ✓ Activity: Discussion-sharing personal experiences with natural radiation.

Part-4: Risk communication (30 mins)

- ✓ Topic: Basics of risk communication and approaches for communicating radiation risk.
- ✓ STEAM focus: Communication and public awareness.
- ✓ Activity: Role-play exercise, taking roles of scientists, journalists and public officer by students and explaining radiation to different audiences.

Part-5: Q/A and reflection (30 mins)

- ✓ Open discussion: Industrial application, ethical concerns and future radiation technologies.

### 3.5.3 EXAMINATIONS (THREE TIMES): FEEDBACK FROM THE PARTICIPANTS PERFORMANCE

Based on the lectures provided through the online and onsite sessions, the examinations were conducted virtually to evaluate their understandings on the contents. Total three times (Day-1, Day-5 and Day-10) were completed with views to obtaining chronological learning performance from the participants. The examination results were carefully checked by JEs.

*A. Participants' performance; average accurate rate (%) of examinations answered by the participants:*

Based on each participant's correct answers for all questions, average accuracy rates (arithmetic mean) in percentage were calculated for three of the test days. The average accuracy rates are given in Figure 27, which presents the regular improvement of the participants' knowledge levels. The average accuracy rates were 60%, 83% and 91% for the days of Day 1, Day 5 and Day 10, respectively. In the case of Day 1, all the participants joined the examination and provided their answers. Consequently, the answers achieved were from twelve (n=12) of all the participants; for which the individual accuracy rates for all questions ranged from 39% to 87% with an average of 60%. The exam score was 46 points, and the accuracy rate was calculated based on their correct answers from the baseline of the total points. Following on each participant's background, this indicates a diverse background of knowledge/understanding concerning the lecture materials before attending the TEWS2025JPN online lectures.

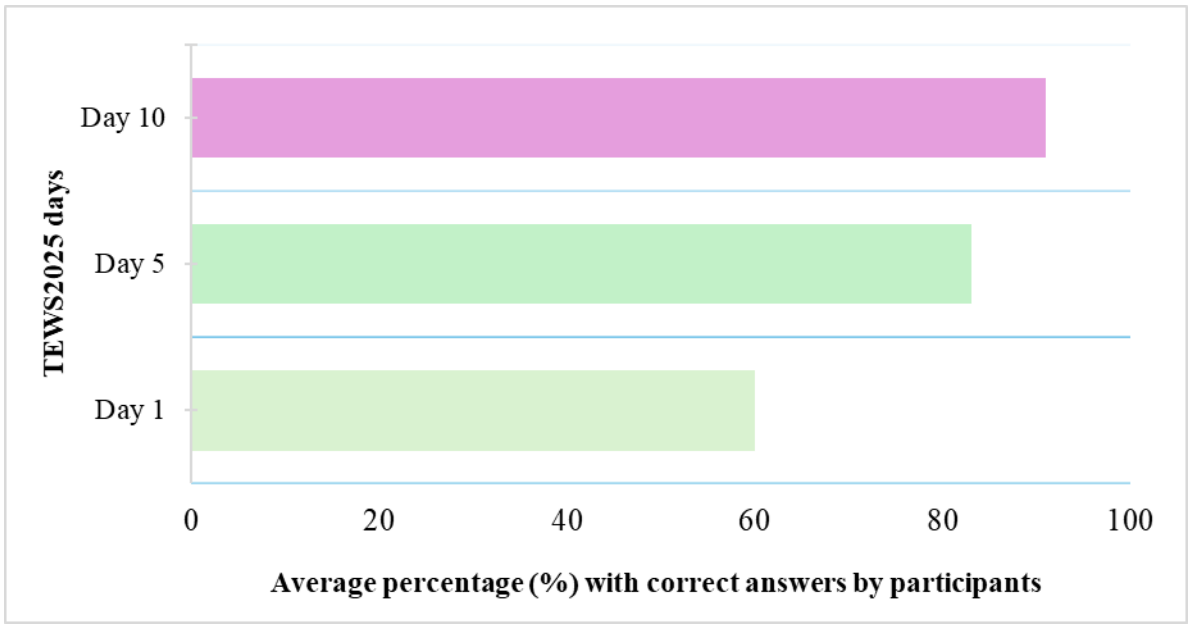



Figure 27: Result of participants' performances (accuracy rates in %) during three days of TEWS2025JPN

On Day 5, when the participants finished the online lectures, a second exam was organised. The participants presented a relatively higher average accuracy rate of 83% (Figure 27). Here, the participant's number was 11 (n=11), one participant did not join the Day 5' s. Thus, the comparison with Day 1 has been made for the individual participants who joined both days' exams. The improvement of each of the participants' accurate answers in Day 5 compared to Day 1, was achieved between the potentially increased range of 17-48%; which presented a statistically significant ($p<0.05$), compared to day 1 (Table 7). Around average 30% of improvement was obtained on Day 5. Only for two participants, slightly increased percentage (up to 4%) were found for Day 5 than Day 1. Thus, they were not included in the range Table 7. Each participant's percentage of accuracy of the correct answers on Day 5 was in the range of 67% and 96%, which clearly presents the effectiveness of the TEWS2025JPN online presentation's effective impact.

Alternatively, Figure 27, as presented below, shows Day 10 with the highest performance of the participants with the average accuracy rate of 91%. Day 10 is the last day of the TEWS2025JPN programme, which covered the on-site lectures for the participants at the UTokyo. Moreover, they visited different laboratories and facility-based activities, potentially under the exam questions' topics. Thus, on Day 10, additional questions concerning the rest of the onsite lectures were added, and the full marks were 58 (rather Day 1, and Day 5 were with 46 marks). Then the accuracy rates were calculated considering the additional questions. The accuracy percentage on the day was in the range of 72 % to 100%. The participant who did not join in answering Day 5, was also missing in answering in Day 10. Furthermore, another participant did not answer properly due to personal reasons (due to loss of concentration/unable in engaging the exam answers/mental issues), the participants were consequently also kept outside of the holistic performance calculation for Day 10. It is noted that the participants' accuracy rate was 93% on Day 5, however, on Day 10, the accuracy was only 57%. While identified a significant impact of the participant's accuracy rate in Day 10 average value (36% reduction in accuracy rates in Day 10 than Day 5), TEWS2025JPN organising member contacted during the analysis and received some issues (described above) as the potential reasons. Finally, the participants (n=10) in the Day 10's participants. While compared with Day 1, the improvement of performance on Day 10 was within the range of 10% to 52%, which presented a significant ($p<0.05$) improvement than Day 1 (Table 7).

Table 7: Ranges of increased accuracy rate of each participant on Day 5 and Day 11, compared to the Day 1 test exam

| Day 5 (increased accuracy %) | Day 10 (increased accuracy %) |
|---|---|
| 17-48 | 10-52 |

Both of the changes are statistically significantly different ($p<0.05$) from Day 1

*B. Accuracy rate of participants' responses for each of the question-based estimation*

Following every question, participants' accuracy of correct answers was calculated. Each of the questions, accurate answers were matched with all the participants' answers for the three days of Day 1, Day 5, and Day 10. An average 61% correct answers were obtained for Day 1 for all the questions (Table 8). Least (<50%) correct answers were found for the questions focusing on radiation risks, carcinogenesis, committed dose, ICRP reference level and risk communications. However, while performing the test on Day 5, the accuracy rates for those question types increased sufficiently. However, overall, throughout the Day 5 performance, about 50% of question answers were not increased. For many of the questions, the accuracy rates decreased. They are mostly from the NORM basic, radiation risk/impact on human body, radioactivity basic, dosimetry, dose calculation and radiation measurement.

Table 8: Average accuracy rates of the participants-for each of the questions in the three days

| Day 1 (%) | Day 5 (%) | Day 10 (%) |
|---|---|---|
| 61 | 63 | 91 |

While applying on the 3rd examination of Day 10, an adequate (average of 91% accuracy rates) was found to be with the question's correct answers by the participants. The possible factor was that the participants obtained on-site lectures and hands-on experiences on PHITS and three systematic lectures on risk estimations, and visited the facilities/laboratory related to NORM/radiation protection and performed systematic discussions among other participants and experts/JEs, these formulated a very well systematic environment learning those question's feature as of practical basis. Each of the question's accuracy on Day 10 was, hence, obtained adequately, and possibly successfully brought about a sustainable understanding among the participants. Although the participant's accuracy rate for the questions in Day 5 reduced, possibly owing to the confusion about receiving numerous similar pieces of information from the lectures, the onsite activities and homework on learning the lecture materials provided a strong basis for overcoming the situation and obtaining a high accuracy rate on the test questions. As clarified earlier, Day 10 tests consisted of additional questions which were based on the onsite lectures, and around 80% of the participants provided the correct answers, which provides evidence of the onsite activities' impact on Day 5's lower overall accuracy rates among the participants.

### 3.5.4 QUESTIONNAIRE RESPONSES (SUMMARY OF PARTICIPANT'S RESPONSES)

| **QUESTION-1**<br>**What is the biggest 'WOW Factor' for students who are listening to your team's RP-NORM syllabus, which you presented on DAY-11?** |
|---|
| ✓ **To learn about one's own country's NORM situation, focusing on natural resources.** |
| ✓ **To offer something real but surprising materials/real world situation to students at the beginning of the lectures. This might be completely new learning for them thinking NORM as of their daily life issues.** |
| ✓ **To provide practical hands-on tools, measurements with track observation by cloud chamber or background measurement through GM counter.** |
| ✓ **To showcase international/regional evidence as poster/media documents for students, as well as the general public, considering the risk communication tools.** |
| ✓ **To avoid misconceptions about radiation, presenting comparative radiation dose, especially natural they are exposing to and artificial, could be one of the tools.** |
| ✓ **To make clear about the potential sources of radiation.** |
| ✓ **To attract students through high-quality images and animations.** |
| ✓ **To adopt storytelling and real-life oriented examples.** |
| ✓ **To keep themselves engaged in applying polls/quizzes/groupwork.** |

**QUESTION-2.1**

**What difficulties do you imagine there would be in your country when lecturing on RP-NORM at university and ensuring that it is understood correctly?**

- ✓ **Lack of equipment and tools (i.e. software) for presenting a practical explanation.**
- ✓ **Lack of local radiation protection/NORM expert(s) and insufficient NORM research development & data.**
- ✓ **Difficulty in harmonising the students' majors with far from knowledge of radiation and NORM.**
- ✓ **Scarcity of technical resources and limitation to the curricula.**
- ✓ **Very new topic to study and severe scarcity of educational institutions where the students can obtain a degree in nuclear science.**
- ✓ **Limitation on translation into the local language: difficult terminology regarding NORM/radiation protection; and cultural barriers that conflict with the conventional educational context.**
- ✓ **Practical application limitation after learning/graduation.**
- ✓ **Misconception of radiation as a matter of harm/fear following the nuclear accidents.**
- ✓ **Lack of NST education.**
- ✓ **Approval of curriculum due to involvement of radioactive materials.**
- ✓ **Access to real-world case studies, fieldwork, or laboratory simulations might be restricted due to safety concerns and university resources.**

**QUESTION-2.2**

**What methods and strategies could be used to overcome these difficulties?**

- ✓ **To arrange sufficient radiation devices and international training/collaborations.**
- ✓ **To spread NORM/radiation protection across different tertiary-level students.**
- ✓ **To design a suitable curriculum/syllabus considering geographical, social and economic conditions.**
- ✓ **To develop educational materials following the country's culture (i.e. language).**
- ✓ **To train faculty members with NORM/radiation protection.**
- ✓ **To establish laboratory along with practical application.**
- ✓ **TEWS2025JPN is one of possible systematic programs to follow.**
- ✓ **To invite experts for training courses.**
- ✓ **To enhance coverage into social media.**
- ✓ **Video presentation in the class showing the key concepts.**
- ✓ **Case study, hands-on practical measurement through simple/common measurement technique.**
- ✓ **To strengthen simulations.**
- ✓ **To arrange visit to the hospital or industry handling NORM for real-world exposure.**
- ✓ **To avoiding the misconception of the danger of radiation, empathizing with the natural radiation situation to the students.**
- ✓ **Competition/quizzes/polls.**

**QUESTION-3.1**

**Please give your impressions of the specialist structure, contents of lectures, site-visits, etc. at this Spring School**

- ✓ **Very impressive and informative.**
- ✓ **The structure was well organized and impressive, but some elements (like PHITS) duration seemed to be shorter as it was the first time learning.**
- ✓ **The facility tour of JCAC and MALT activities, and police and fire stations were of special skills and fascinating.**
- ✓ **The organization and hospitality were amazing, and the time schedule maintenance was amazing/more than expected.**
- ✓ **Very informative, well-organized, and balanced between theory and practice.**
- ✓ **The combination of online lectures and onsite programs is amazing.**
- ✓ **Well-organized lectures covering a wide range of topics related to RP-NORM. all contents were perfectly understandable and combined theory, practical applications, and updates on cutting-edge research.**
- ✓ **The course was also impressive with learning about Japan's strong culture and safety issues.**
- ✓ **The course provided Japan's experiences about tackling nuclear accidents and recovery approaches, which were also impressive.**
- ✓ **The course provided Japan's strategies regarding how to use utilizing how the radiation technologies efficiently and safely.**
- ✓ **The INSTA Spring School on Advanced Radiation Protection Focusing on NORM under Risk Management & Communication (TEWS2025JPN JPN) offers a well-structured, interdisciplinary learning experience highly relevant to public health medicine, particularly in the domains of occupational health, environmental safety, and risk communication.**
- ✓ **From a public health medicine specialist's perspective, the structure of TEWS2025JPN aligns with essential public health principles:**

  **- Comprehensive & Evidence-Based – The program integrates scientific knowledge, regulatory frameworks, and real-world applications, ensuring that public health professionals can effectively assess and manage radiation risks.**

  **- Interdisciplinary Collaboration – The mix of academics, industry experts, and policymakers provides a broad perspective, essential for effective public health interventions.**

  **- Practical Training & Site Visits – Hands-on exposure to radiation detection, safety procedures, and risk management strategies enhances applied learning, which is crucial for public health specialists dealing with environmental and occupational radiation exposure.**

  **- Focus on Risk Communication – Given the public's general fear and misconceptions about radiation, the emphasis on effective risk communication is particularly relevant for health professionals involved in policymaking and public health advocacy.**
- ✓ **The core topics covered in the training are critical to public health, radiation safety and policy development.**

  **- Public Health-Relevant Topics Expected in TEWS2025JPN Radiation Health Effects & Epidemiology – Understanding stochastic vs. deterministic effects, long-term cancer risks, and dose-response relationships is crucial for health risk assessments.**

  **- Risk Assessment & Exposure Monitoring – Public health experts must evaluate exposure from NORM in workplaces, water supplies, and food chains, particularly in mining, oil & gas, and construction industries.**

  **- Regulatory Frameworks & Policy Development – International regulations (e.g., IAEA, WHO, national radiation safety policies) will be covered, providing insights into legal compliance and governance.**

  **- Crisis & Risk Communication Strategies – Managing public perception of radiation risks**

**through evidence-based messaging and stakeholder engagement is key to preventing misinformation and panic.**

**-Environmental & Occupational Safety Measures – Strategies for mitigating exposure to radiation in various industries align with occupational and environmental health regulations.**

**-Innovations in Radiation Protection Technology – Understanding advances in dosimetry, shielding materials, and monitoring devices equips public health experts with better tools for intervention.**

- ✓ **Site Visits & Hands-On Training:**

**-The inclusion of field visits to radiation facilities, research institutions, or industrial sites provides a first-hand understanding of radiation safety protocols in action. This is crucial for:**

**-Occupational Health Interventions – Observing radiation safety measures in workplaces ensures that public health officials can recommend practical solutions to protect workers.**

**-Regulatory Implementation – Seeing how Japan enforces NORM regulations provides valuable insights into policy effectiveness and areas for improvement in other countries.**

**-Emergency Preparedness & Response – Real-world scenarios help prepare public health professionals for radiation incidents, whether from industrial exposure, accidents, or potential radiological emergencies.**

- ✓ **Professional Networking & Knowledge Exchange**
- ✓ **TEWS2025JPN is also an excellent platform for international networking, allowing public health professionals to:**

**-Collaborate with Global Experts – Learn from IAEA, WHO, and national radiation safety agencies about best practices and policy trends.**

**-Develop Guidelines & Best Practices – Engage in discussions that contribute to public health policy improvements in radiation protection.**

**-Enhance Public Awareness & Advocacy – Strengthen strategies for educating communities and industry workers about NORM risks and safety measures.**

- ✓ **From a public health medicine specialist's perspective, TEWS2025JPN is an exceptionally well-designed program that provides:**

**-A balance of theoretical knowledge and applied learning**

**-Critical skills in risk assessment, policy development, and crisis communication**

**-Exposure to cutting-edge radiation safety practices**

**-Opportunities for global collaboration in public health and nuclear safety**

**QUESTION-3.2**

**Please give your impressions of the support provided by the Japanese host team of this Spring School**

- ✓ **The whole team was very supportive, always available, having profound insights & knowledge, wonderful at everything, welcoming as family members.**
- ✓ **Members of a very friendly, organized.**
- ✓ **Advanced communication and information sharing were very effective.**
- ✓ **Prof. Iimoto's positive energy was truly inspiring. All the professors, organizers, and JEs were so generous and kind. I honestly don't know how to express my gratitude for this amazing experience. It is truly one of the best experiences of a participant's lives.**
- ✓ **The team demonstrated a high level of professionalism, efficiency, and hospitality, ensuring a seamless and enriching learning experience for all participants.**
- ✓ **Organizational Excellence & Pre-Event Coordination**
  **-Clear & Well-Structured Communication – The invitation letter and handbook provided detailed information on the schedule, objectives, and logistics, reflecting meticulous planning.**
  **-Visa & Travel Assistance – The host team likely facilitated the visa application process, travel guidance, and accommodation arrangements, ensuring smooth entry into Japan.**
  **-Pre-Event Briefings & Materials – The provision of lecture materials, preparatory readings, and guidance documents before arrival showcases a commitment to maximizing learning outcomes.**
- ✓ **Academic & Technical Support**
  **-Expert-Led Sessions – The program features leading Japanese experts in radiation protection and NORM, ensuring high-quality lectures and discussions.**
  **-Well-Equipped Facilities – Access to state-of-the-art research centres, laboratories, and industry sites enhances hands-on training.**
  **-On-Site Assistance – The presence of technical staff, interpreters (if needed), and facilitators ensures smooth engagement during lectures and field visits.**
- ✓ **Hospitality & Cultural Engagement**
  **-Warm Welcome & Cultural Sensitivity – The Japanese team is known for their hospitality and respect for diverse cultural backgrounds, making international participants feel comfortable.**
  **-Cultural Exchange Opportunities – The inclusion of social events, networking sessions, or cultural experiences allows participants to appreciate Japanese traditions while fostering professional relationships.**
- ✓ **Logistical & Site Visit Arrangements**
  **-Efficient Transport & Site Access – Well-organized transportation to nuclear research centres, regulatory agencies, and industrial facilities ensure smooth participation in field visits.**
  **-Safety & Security Measures – Strict adherence to radiation safety protocols and site regulations reflects Japan's commitment to ensuring a safe and informative experience for all participants.**
  **-Dietary & Accommodation Considerations – The host team likely ensures that dietary needs and lodging preferences are met, accommodating participants from different backgrounds (Muslim and non-Muslim).**
- ✓ **The host teams in Japan typically provide:**
  **-Well-Structured program**
  **-High-Quality Facilities**
  **-Strong Industry and Government Links**
  **-Cultural and Social Engagement.**
- ✓ **They are like families with well-coordinated experiences for learning, networking, and cultural exchange**

**QUESTION-4**

**Would you like to introduce your colleagues to a Phase-II School like this? If so, what kind of NST theme would you like for them?**

- ✓ **Radiation protection and NORM.**
- ✓ **MCMP OR PHITS OR SIMILAR SOFTWARE.**
- ✓ **Medical and industrial applications of NST can be very interesting, just like NORM. Actually, when you go deep into a special topic, there are many interesting things to be learnt. In this sense, all topics can be fascinating, regardless of the lecturers.**
- ✓ **All NST themes.**
- ✓ **Medical Physics.**
- ✓ **Nuclear Analytical Techniques, Complementary techniques of Nuclear Science.**
- ✓ **Definitely would recommend this Phase-II School to my colleagues and peers—and would love to join such a program again in the future. The topics most interested in including radiation crisis management, the applications of nuclear technology in various fields, and effective communication with the public and local communities, especially farmers, in areas affected by radiation incidents. I hope to further explore and develop work related NORM.**
- ✓ **Worker safety in oil & gas, mining, and manufacturing industries. Advanced radiation detection & shielding technologies. Compliance with IAEA & national regulatory standards.**
- ✓ **Definitely recommend a Phase-II School like this to colleagues, especially those interested in applied Nuclear Science and Technology (NST).**
- ✓ **Advanced Radiation Detection and Monitoring.**
- ✓ **Decommissioning and Waste Management of NORM & Nuclear Facilities.**

**QUESTION-5**

**Please give us any other messages you would like to share**

- ✓ **Please continue to support RP and NORM.**
- ✓ **Thank you very much, your work is amazing.**
- ✓ **Grateful for this opportunity to all. Great learning and cultural exchange.**
- ✓ **Thank you. It was a fun and rewarding time with you.**
- ✓ **Preference as if we are given lifetime access to the course modules of phase I. If we develop curriculum, if they are available for us, it would be really helpful.**
- ✓ **The school in Japan was very informative and gained very good knowledge, but duration was so short.**
- ✓ **I would like to express my sincere thanks once again for this wonderful opportunity. This experience has truly inspired me—not only in terms of knowledge, but also in witnessing how international collaboration and kindness can lead to meaningful learning. Am determined to make the most of what Have learned and apply it for the benefit of others. Will do my best to communicate accurate information and keep doing more. I truly hope to see the development of a strong safety culture in my country. Would really miss Japan and hope we will have the chance to meet again in the future.**
- ✓ **Participating in the INSTA Spring School (TEWS2025JPN) has been an enriching and eye-opening experience, particularly from a public health and radiation protection perspective. The well-structured program, expert-led sessions, and hands-on training have provided valuable insights into NORM management, risk communication, and regulatory frameworks.**

  **Important Key Messages I would like to Share:**

  **-Bridging Nuclear Science & Public Health**

  **As a public health medicine specialist, I strongly believe that radiation protection should not be limited to nuclear experts but must be integrated into public health policies to ensure occupational and environmental safety.**

  **-Advanced Risk Communication & Public Awareness**

  **-One of the most critical challenges in radiation safety is public perception and misinformation.**

  **-Programs like TEWS2025JPN equip professionals with the skills to communicate risks effectively, which is essential for building trust and informed decision-making.**

  **-International Collaboration is Key: The opportunity to engage with international experts, researchers, and policymakers' highlights the importance of global collaboration in radiation safety. This knowledge-sharing platform strengthens our collective ability to develop better policies, improve safety protocols, and address emerging challenges in nuclear science and technology.**

  **-Encouraging Continuous Learning & Future Participation-**

  **highly encourage my colleagues, especially those in public health, environmental safety, and regulatory bodies, to participate in future NST-related Phase-II Schools. Expanding knowledge in nuclear science, medical applications, and radiation protection will greatly benefit our fields.**

  **-Gratitude to the Japanese Host Team & Organizers: A sincere thank you to the Japanese host team, INSTA, and all organizers for their exceptional hospitality, professionalism, and dedication in making TEWS2025JPN a success. The experience has been well-organized, highly educational, and deeply impactful.**

  **-Would look forward to applying the knowledge gained in public health policy, radiation safety, and medical applications of nuclear science. Also hope to continue collaborations with experts in this field to further improve nuclear safety and risk management in our respective countries.**

## 4. CONCLUSION - Message and Recommendation for the Future Institutions of the INSTA School from the Local Director of TEWS2025 JPN

**Executive Summary:**

The TEWS2025JPN programme – the INSTA's first-ever Spring School – was organised by the JVET with specialisation in advanced radiation protection and NORM training among the tertiary level of educators. The programme presented very systematic and well-organized online and onsite lectures, hands-on tools experiences, site- & laboratory-visits, future perspective-based discussions, and chances of international collaborations and cooperations. In addition, the participants were from a total of 17 countries with diverse cultural aspects which received significant success in sharing international cultural exchange issues with this TEWS2025JPN program.

**Recommendations for the Future Organising Institutions of the INSTA School:**

Under the coordination by the local director, the strategy and the contents were deeply discussed, precisely arranged and prepared among the members of the JVET. Based on our experiences as shown in this report, the JVET would recommend that following items would be main points to be considered for the future organising institutions of Phase II of the INSTA.

✓ **Integration of the School as Phase II under the INSTA EPE:**

- The organising institute should note the Phase II is under the harmonisation of the INSTA EPE, which means all activities during the course should be under international collaboration.
  - **Eg) International Lecturers**
    - Lecturers could be invited from all of the Institutional Members of the INSTA, and the School could be hosted by multiple institutes over countries and regions. In TEWS 2025JPN, we invited 6 excellent lecturers from another country to pursue internationality.

✓ **Function of the INSTA in course of Organisation:**

- The organising institute should note the purpose of the INSTA is to support the Institutional Members.
- They should select a topic that aligns with needs and requests of Institutional Members based on analysis of WG1. For TEWS2025JPN, the JVET determined it in alignment with the discussion among WG3 following the information provided by WG1 alongside the consultation with Steering Committee.

✓ **Multidisciplinary Curicula:**

- The organising institute should develop contents of the School with possibility of participation whose background is not always NST – the contents have to be collaborated with various fields.
- The subjects of Phase I's lectures may serve as a reference. The aim is to motivate members with different specialisations of expertise to participate and to foster expectation that they will be able to deliver lectures on NST in line with their own fields of expertise after completing the event.
- In TEWS2025JPN, 'Comprehensive, Medical and Chemical Risk-managements' were taken as three face-to-face lectures in the course. In addition, technical visits to police and fire stations were also effective to have the participants imagine, then resulting in an attractive narrative enough to integrate both NST and other topics.

✓ **Originality:**

- The organising institute should arrange the course based on the viewpoint of the host's originality. They are recommended to emphasise advantages of pursue of originality in planning the activities. For the TEWS2025JPN, we selected NORM as the topic as it is widely known that NORM has been shed with the most advanced related discussion as a topical issue.

- Moreover, it is closely related to diversified environments in radiation protection after a nuclear disaster such as the Fukushima Daiichi NPP accident, alongside technical visits to JCAC and MALT so that both can be practically memorable for the participants in their respective countries in safety and security.

✓ **Stakeholder Involvement through Encouragement of Young and Mid-career Professionals:**

- The organising institute should encourage both young and mid-career professionals as much as possible in preparation process, so that they can – as future leaders in the region – practically learn respective procedures by bolstering the knowledge management to the youth. In TEWS2025JPN, the JVET organised the JEs – they are mostly students of the local director lab – one of the JEs were appointed such as a young researcher or its leader. All of the JEs fulfilled their respective roles, letting them learn extensively, gain valuable experience, and achieve significant growth.

✓ **Public Relations through the INSTA Website:**

- The organising institute should prepare a website tailored for the INSTA School by linking to the INSTA official website. In TEWS2025JPN, the JEVT prepared the own website tailored for the School (https://jvet.jp/archives/seminars/ttws2025) so as to share all of the School information and lecture materials while liking to the INSTA official website.

✓ **Awareness of the Cultural Differences:**

- The organising institute should 1) look into the latest situations in the participants' countries or regions including culture, religion, politics, conflicts as much as possible in advance; 2) take all necessary cares for planning and operation; and 3) make appropriate arrangements in consultation with the IAEA's relevant officers (if any).
  - ✧ **Eg) International Lecturers**
    - Lots of Muslim participants joined TEWS2025JPN.
    - The JEVT took a reasonable care by gathering much information to make efforts to ensure they could work comfortably during the School. Through this process, the JVET also learnt experienced and enjoyed different cultures, which may be a heart of the INSTA as a pioneering platform also taking into account of mutual intercultural exchange and cooperation.

✓ **Evaluation of the School:**

- One of the most important fruits is the participants' satisfaction. According to their responses to the questionnaire, it can be concluded that the TEWS2025JPN well overall succeeded.
- Seeing how the participants got enough knowledges and technical skills on NORM radiation protection to streamline in the respective countries, the examinations provided the good results enough to showcase. Based on each lecture content and understanding, the examinations were designed for the obtainment and the gradual improvement regarding the TEWS2025JPN materials.
- The comparative results on 'accuracy' per the participants on Day 1(before obtaining any lecture), Day 5(completing online lectures) and Day 11(completing online and on-site lectures along with the site-visits and discussion sessions) presented significant gradual successes to attain advanced knowledges of NORM and radiation protection designed by TEWS2025JPN programme. The gradual accuracy rates were demonstrated as the participants obtained as 60%, 83% and 91% among the days.

✓ **'WOW Factors' as the Core Values of the INSTA:**

- The organising institutes also are required to recall the INSTA's keywords are 'WOW factors' alongside the STEAM education, whereby, the member of the organising institutions "should" enjoy and be at the same time impressed on the planning of the course with the participants. The JVET believe it was successful in the first INSTA Spring School, resulting 'WOW Factors' made the atmosphere of the School more brilliant, energetic, interactive, stable and popular with the attractive potential region leaders – the 'INSTA challengers'.

## VIEWPOINT OF THE TEWS2025JPN SECRETERIAT



The Secretariat has a prominent role in delivering the necessary information, files and any other relevant instrument to the participants as well as accessible website, so that management can be effective and to ensure smoother sharing of the latest version of the documents.

The structure of this website should be highlighted here to illustrate the necessity of 'simplicity': it does not require a login with ID, and anyone who knows the password can access view and download files. For the future management of the INSTA School, it is highly recommended to prepare tools that are easily accessible, not only for the participants but also for the secretariat themselves.

Also, it should be noted for the Secretariat that most of the participants in the INSTA Spring School were Muslims. In addition to the small portion amongst the Japanese population on Muslims in Japan, confronting their stays in Japan were coincided with Ramadan, which required the Secretariat to recognise it more challenging than usual to run the School.

However, as being respectful for each participant's culture is the foundation or infrastructure of international communication, it is now recalled that the Secretariat was taking the lead to interview the participants in advance on what would have been needed and have tried to prepare as elaborately as possible despite our unfamiliarity with their culture and customs. Not only did the participants enjoy Japanese culture, but the Secretariat on behalf of the JVET. It was also an invaluable opportunity in terms of cross-cultural communication.

As the leading member of the Secretariat on behalf of the JVET for the INSTA Spring School required preparation and handling of all matters; it is now advisable that the Secretariat is a frog of team comprising several members who share their responsibilities. It is also advisable to have a good working relationship with all stakeholders – regardless of they are internal or external – including the Ministry of Foreign Affairs and other government agencies, in order to insure the organisational integrity for the successful implementation of the School, also assessing plausibility of any difficulties that may arise when welcoming participants from abroad.

**Mr. Tominori Suzuki**
President, STIF



I am Tominori SUZUKI, the president of the Science and Technology Information Forum. We would like to express our gratitude to all participants as the local host for our INSTA school. The main purpose of our forum, NPO-STIF, is to promote understanding of the environment and safety in our society by researching scientific and technological information on the environment and safety. In addition, we develop human resources who are active in these fields. We believe this is essential for the sustainability and development of an affluent life for the people and citizens of Japan and overseas. Japan experienced one of the largest nuclear disasters in Fukushima in 2011, “radiation protection” became an important theme in school education. "INSTA Spring School 2025 Japan" hosted by us has shown Japanese experiences on the environment and safety education focusing on radiation protection of naturally occurring radioactive materials. We believe our fruits of spring school will strongly support the participant countries in the Asia Pacific region to sustain the environment, health and safety.

Finally again, we would like to express our greatest gratitude to both the INSTA steering committee and International Atomic Energy Agency holding this school in Japan, and to two Japanese ministries, Ministry of Foreign Affairs and the Ministry of Education, Culture, Sports, Science and Technology, officially supporting us. In addition, we would like to express our gratitude to excellent lecturers and junior experts from The University of Tokyo and other Japanese organizations. We believe all of you enjoyed our school in Tokyo, Japan. Thank you very much.

## VIEWPOINT OF TEWS2025JPN MVP (MOST VALUABLE PARTICIPANTS: MS. NADIA'S OPINIONS, AS OF THE REPRENTATIVE PARTICIPANTS OF TEWS2025JPN PROGRAM)

**Ms. Nadia Babaei Bidmeshki**
Nuclear Science and Technology Research Institute (NSTRI), Atomic Organisation of Iran (AEOI)



### 1) Please kindly let me know overall impression of the School.

An experience that I will cherish thoroughly was attending the *INSTA Spring School of Advanced Radiation Protection Focusing on NORM* in Tokyo, Japan last month. The scientific community abroad is a lot more welcoming. There is space for everybody, a co-operative, interactive, free environment full of encouragement and growth. The JVET helped me get in touch with great minds, of diverse backgrounds, who took out valuable time for good, productive scientific discussions. And Tokyo was truly stunning! With all the restrictions in language, it truly was a special time that I was fortunate to experience. How can I not thank Japanese Government, the UTokyo, STIF and the IAEA for funding my journey and providing me with this opportunity!

### 2) What brought you in the first-ever INSTA EPE & on-site Spring School?

As someone actively involved in promoting NST among Iranian students, teachers and university audiences, I recognised the importance of receiving professional training to ensure the content I deliver is both accurate and engaging. To spark greater interest in nuclear fields and help cultivate the next generation of scientists, I need to understand not only *what* to teach, but *how* to teach at the right level and according to international standards.

The INSTA programme stood out as a unique opportunity to deepen my expertise and refine my educational approach. The topic of Naturally Occurring Radioactive Material (NORM) is particularly significant in Iran, where industries like oil and mining frequently encounter related challenges. While regulatory frameworks exist, my aim is to go beyond compliance and contribute to building a culture of awareness and safety. I'm especially interested in finding effective ways to engage engineering students with practical, interdisciplinary learning about NORM. By integrating insights from this program into both academic settings and industry outreach, I hope to advance best practices and promote scientific collaboration across the region.

### 3) How interesting, useful & effective was this School & the INSTA EPE for your career & practices in your institute?

Everything offered through this Spring School—both the 5-day online course and the 6-day on-site school—was incredibly informative and enriching. The instructors were highly professional and managed to convey a great deal of knowledge effectively within the limited time. The same can be said for Phase I of the INSTA EPE.

Although I hold a PhD in Nuclear Engineering with a focus on radiation applications, I still found the content of the school to be remarkably valuable. Participating in this program has contributed significantly to both my scientific development and personal growth.

I benefited from the training in two key areas: first, in advancing my own research and applied scientific work, and second, in my outreach efforts—particularly in transferring knowledge to teachers and students as part of my mission to promote nuclear science and technology. This dual impact makes the experience deeply meaningful for my current role and future career.

### 4) Which components of the School were most interesting, useful & effective for you?

This is a difficult question to answer, as the entire experience was truly enriching. First and foremost, I

must highlight the unique value of in-person participation. Being physically present in a classroom offers a much deeper learning experience compared to online or offline training. Similarly, site visits had an even greater impact than classroom sessions—they were both highly educational and inspiring. The School was clearly designed and executed in a way that fully engaged participants through a variety of learning tools. Lectures, lab visits, group discussions, and interactive activities all worked together to reinforce learning and make the experience more memorable.
Personally, Dr. Ogawa's class and the introduction to the PHITS simulation code were particularly exciting and relevant to my interests. I was also deeply impressed by the visit to the JCAC laboratory, which demonstrated the remarkable scientific capabilities of Japanese researchers in detecting extremely low levels of radioactivity. Another highlight was the visit to the fire station, which I found both thrilling and insightful. I believe that many participants, myself included, would not have had the opportunity to visit such secure and operationally sensitive sites—like police or fire stations—in their own countries. This reflects the strong coordination and connections of the UTokyo, especially through Prof. Iimoto, with local institutions, which greatly enriched the overall experience.

5) How do you maximize the knowledges and experiences you obtained by attending this School for your career?

I am committed to applying the knowledge and experiences gained from this School in both my academic and outreach work. On one hand, I will integrate what I've learned—especially on topics like NORM, radiation safety, and simulation tools such as PHITS—into my research and teaching activities, helping to raise the scientific standards of the content I deliver.
On the other hand, my role as a science communicator and promoter of nuclear technology allows me to directly share this knowledge with a broader audience, including teachers, students, and young professionals across Iran. I plan to organize workshops, lectures, and outreach activities that translate complex topics into accessible and engaging material, aligned with international standards.
In addition, the international experience and exposure to best practices in Japan have inspired me to strengthen regional collaboration and encourage interdisciplinary approaches to radiation education and safety. By combining scientific insight with effective communication, I aim to both advance my own career and contribute to building a more informed and capable community in the nuclear field. I believe my passion for education, dedication to research, and enthusiasm for knowledge-sharing make me a strong and committed participant in this initiative.

6) Which lectures and/or discussions brought good improvements for your presentation?

Since my academic background is not directly related to education or learning sciences, completing Module 1 of the INSTA program was especially valuable for me in designing educational content and training sessions. During the group discussions, we often referred back to the models and principles introduced in this module to shape our approach. I was also inspired by the structure and delivery of the INSTA program itself. Its thoughtful design served as a strong example of how to organize effective learning experiences. In terms of content, my background in nuclear science provided a solid foundation for designing technical materials. However, the "WOW Factors" that helped enhance the presentation came from the inspiring visits to the JCAC laboratories. The creativity and precision demonstrated there greatly influenced our thinking. I'd also like to express my appreciation for my group members, Dr. Obeid and Dr. Bin Abdullah, who contributed fascinating ideas and made the discussions even more engaging and insightful.

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## EDITOR'S NOTE

**Md. Mahamudul HASAN, PhD**
Project researcher
Division for Environment, Health and Safety, the UTokyo



Is one of the best programmes in my life: interaction of education, society, health and culture!

As one of the host members, my core responsibility was interaction and coordination with directors, secretariat, experts, JEs and all participants throughout the TEWS2025JPN programmes. Thus, it was a cherishing time to love making bridging with different arrangements and fruitful running of the program.

As a graduate student at tThe University of Tokyo, whilstI workingked with NORM and radiation protection for Asian regions,. it can be without doubt tThis INSTA school (TEWS2025) brought about a new perspective inspiring, making broader fruitful activities throughout the world. As a young scientist, the arrangement with the program was the biggest in my life with numerous issues.

As of the only Muslim member of the TEWS2025JPN team, it was my great pleasure to perform teamwork activities with other team Japan's members to arrange Muslim programsprogrammes; the whole month was within the fasting month of Ramadan. With very kind supports and strong cooperation from all IIMOTO laboratory members, Japanese members involved with TEWS2025JPN programme, it we should be noted here that it was  were able to successfullsuccessful toy arrange all Muslim preparations.

It was fun to interact internationally not only with education and knowledge but the cultures. Participants from 17 countries participated in this program. It was very nice to ascertain numerous cultural issues into the future perspectives of the INSTA School's regional radiation protection and NORM issues. The extensive discussions among all members, diverse and systematic lectures, site visits, and group work activities formulated a successful holistic module to learn NORM and radiation protection. While incorporating the tests among participants using the three-time framework, a chronological and significant improvement was achieved. The group-based scheme for future modules concerning NORM and radiation protection as part of risk communication is very effective and will work as a baseline for the future INSTA program.

I wish: TEWS2025JPN will work as a baseline expanding NORM, RP, NST worldwide under INSTA.

# APPENDIX-A
# (Questions list)

Table 9: List of questions for the test, answered by the participants

| Lecture No | (Theme)<br>Questions |
|---|---|
| **1** | (Radiation Protection Score and World)<br>1: Describe the definition of "NORM" based on the IAEA Nuclear Safety and Security Glossary (2022) |
| **2** | (Radiobiology)<br>2-1: What are the indirect biological effects of ionizing radiation?<br>2-2: What are the 4 stages of Acute Radiation Syndrome (ARS)? |
| **3** | (Radiation epidemiology)<br>3-1: What is a radiation epidemiological study regarded as the golden standard for estimating radiation risk?<br>3-2: List factors that may modify cancer risk. |
| **4** | (Nuclear physics, radiation physics and chemistry)<br>4-1: Define the half-live and explain if it can be changed for a specific nucleus.<br>4-2: Determine the decay mode for the following isotopes |
| **5** | (Radiation measurements)<br>5-1: What is the primary mechanism that happens in detector materials that means to detect the incoming radiation?<br>5-2: What type of radiation detector provides the best energy resolution for photon measurement? |
| **6** | (Advanced understanding of radiation units)<br>6-1: Which of the following quantities or factors is not used in calculating effective dose?<br>6-2: Which of the following tissues or organs has the lowest radiation sensitivity related to carcinogenesis? |
| **7** | (Dosimetry and Dose estimation)<br>7-1: What is the purpose of 'DOSIMETRY'?<br>7-2: What is a committed dose? |
| **8** | (RP in Safety and Security)<br>8-1: What are the three principles of external radiation protection?<br>8-2: What are the dose limits for radiation workers and the public by the latest ICRP recommendation? |
| **9** | (Radiation Protection in Planned and Emergency exposure situation)<br>9-1: Describe the definition of "Planned Exposure Situation" based on the ICRP Pub. 103.<br>9-2: Show the band of the reference level of public for the Emergency Exposure Situation based on the ICRP Pub. 103. |
| **10** | (RP for radioactive wastes)<br>10-1: What is the recommended safety strategy for solid radioactive wastes advocated in the IAEA's SSR-5?<br>10-2: Describe the strategy of post-closure radiation protection of radioactive waste disposal, comparing them with radiation protection during the operational period of a waste facility. |

| | |
|---|---|
| **11** | (Radiation Protection in Existing Exposure Situation)<br>11-1: Describe the definition of "Existing Exposure Situation" based on the ICRP Pub. 103.<br>11-2: Show the band of the reference level for the Existing Exposure Situation based on the ICRP Pub. 103. |
| **12** | (Risk communication in RP)<br>12-1: What are the two primary aspects of risk based on the IAEA Technical Document IAEA-TECDOC-1209, Risk Management?<br>12-2: What are at least three variables that influence perceived risk in risk communication? |
| **13** | (Radiation Protection for NORM)<br>13-1: Show three examples of industries that may cause NORM-related exposure of works, the public, and the environment.<br>13-2: Show the main indoor radon sources. |
| **14** | (Analytical understanding of radiation behavior -PHITS training)<br>14-1: What is Monte-Carlo calculation?<br>14-2: What do you do to reduce the statistical uncertainty of Monte-Carlo calculation?<br>14-3: Exemplify two applications of Monte-Carlo radiation transport simulation?<br>14-4: What are the three essential elements of radiation transport calculations? |
| **15** | (Integration of thinking with other disciplines related to risk management- Medical Risk)<br>15-1: Describe the elements that form the basis of assessing risk of biological hazards |
| **16** | (Integration of thinking with other disciplines related to risk management -Chemical Risk)<br>16-1: Give at least two examples of familiar products that can cause fires or explosions. |
| **17** | (Integration of thinking with other disciplines related to risk management – General Risk)<br>17-1: What are the four strategies for risk response?<br>17-2: What are the two main aspects to consider when assessing a risk? |

## APPENDIX-B

# (Reports from junior experts)

| Date | **Lecture no** | Lecturer |
|---|---|---|
| 3/3/2025 | **1** | Prof. Takeshi IIMOTO |
| Theme | Radiation Protection Scope and World - its infinite possibility as an education theme | |

*Main contents of the lecture:*

Prof. IIMOTO began his lecture by emphasizing the significance of STEAM education and the "WOW factor" as critical elements in advancing radiation protection education. He highlighted the current state of these educational challenges and their relevance to the field. The lecture then focused on the key themes of this TEWS (Technical Meeting on Education and Training in Radiation Protection), specifically Radiation Protection (RP) and Naturally Occurring Radioactive Materials (NORM). Prof. IIMOTO provided a brief introduction to the fundamental knowledge of radiation, which will be explored in greater detail throughout the TEWS. He also outlined essential RP concepts and illustrated them with examples, such as the ambient dose rates observed around Fukushima Prefecture. Additionally, the lecture touched on the processes involved in nuclear power plant operations and the associated radiation protection principles. This comprehensive overview set the stage for deeper discussions on RP and NORM-related topics in the sessions to follow.

*Participant's response (Q/A):*

Q/A session not included in this lecture.

*Junior expert's feeling /opinion:*

As the opening lecture, Prof. IIMOTO provided a comprehensive and forward-looking introduction to RP-NORM, as well as the importance of educating the next generation through STEAM and the "WOW factor." This session offered a concise overview of the central themes of this TEWS (Technical Meeting on Education and Training in Radiation Protection) and the broad scope of knowledge it aims to address. By setting the stage for the discussions to come, this lecture not only boosted participants' motivation but also equipped them with valuable insights for long-term planning and study within TEWS framework of TEWS.

| **Junior expert name** | **Qianhao JIN** |
|---|---|

| Date | **Lecture no** | Lecturer |
|---|---|---|
| 3/3/2025 | **2** | Dr. Adnan M. EKHTIAR |
| Theme | Radiobiology | |

*Main contents of the lecture:*

Dr. EKHTIAR addressed radiobiology, covering ionizing radiation effects on biological tissues, cellular responses, and radiation-induced damage. He explained fundamental radiobiological terminology, radiosensitivity, and different types of ionizing radiation, including electromagnetic and particulate radiation. He illustrated the mechanisms of radiation interaction with biological matter, detailing direct DNA damage and indirect damage mediated by reactive oxygen species. Various DNA damage types were discussed, including single-strand breaks, double-strand breaks, and chromosomal aberrations, alongside their repair mechanisms and consequences for cellular viability. Dr. EKHTIAR elaborated on cell survival curves, radiosensitivity factors, and the effects of total body irradiation, including acute radiation syndrome and long-term stochastic effects.

*Participant's response (Q/A):*

The question was about the professor's discussion on many factors that influence the response of cells to radiation, like how temperature affects radiation response among the physical factors, and the professor responded that temperature has a large effect on the cellular response to radiation, and that the exact effect depends on the temperature conditions at the time of radiation exposure. At low temperatures, typically 4°C to 20°C, the damaging effects of radiation on cells are diminished. This is because low temperatures reduce the metabolic rate of cells and decrease the production of free radicals, thereby reducing radiation-induced DNA damage. In addition, low temperatures may inhibit the activity of DNA repair enzymes, delaying the repair process, but at the same time may reduce the occurrence of mis repair. At the standard physiological temperature of 37°C, the metabolic activities of the cells are normal, and radiation-induced DNA damage and repair processes are at routine levels.

*Junior expert's feeling /opinion:*

As an advanced-level lecture, instructing the participants on radiobiology concepts was highly engaging. The discussion on radiation-induced biological effects, DNA damage mechanisms, and radiosensitivity provided a strong foundation for understanding the subject. The explanation of deterministic and stochastic effects, along with radiation-induced cell death and survival curves, was particularly enlightening. The segment on radiation effects on embryos and fetuses was an essential highlight, detailing the sensitivity of different developmental stages to ionizing radiation. The integration of real-world examples added practical value.

| **Junior expert name** | **Xueqing WANG** |
|---|---|

| Date | **Lecture no** | Lecturer |
|---|---|---|
| 04/03/2025 | **3** | Dr. Michiya SASAKI |
| Title | Radiation Epidemiology | |

*Main contents of the lecture:*

Dr. Michiya Sasaki's lecture covered key aspects of radiation epidemiological studies, providing an overview of research on both high-dose (high dose-rate) and low-dose (and/or low dose-rate) exposure. He emphasized the importance of understanding the broader context of epidemiological studies, rather than focusing solely on the excess relative risk (ERR) values. He also highlighted the necessity of understanding the assumptions underlying risk inference for radiological protection. Additionally, he stressed the significance of Hiroshima and Nagasaki's tragic histories, urging researchers to consider the feelings of atomic bomb survivors with sensitivity and respect. He reminded the audience that using valuable data from such events is a privilege and should be approached with humility.

*Participant's response (Q/A):*

Q: Are there any records of radiation resistance in populations living in high background radiation areas such as Ramsar, Iran?
A: In certain regions of Ramsar, Iran, natural background radiation levels may reach up to 100 mSv per year. The population of Ramsar is relatively small, whereas in the Kerala region, there are approximately 70,000 residents. Due to the limited population size and challenges in long-term data collection, conclusive evidence remains lacking. While some biological effects have been observed, there are few records confirming whether residents have developed resistance to radiation. No definitive link has been established between high natural radiation exposure and radiation resistance.
Q: Can the ICRP public dose limit of 1 mSv per year for public be increased?
A: The possibility of increasing the ICRP public dose limit remains controversial. While some argue that slightly higher doses do not significantly increase health risks, recent studies, such as the INWORKS study, suggest a correlation between radiation exposure and an increased cancer risk. The existence of a threshold dose remains a debated topic, with ongoing research in radiobiology contributing new insights. Public perception of radiation safety also plays a crucial role in policy decisions. Given the evolving scientific understanding and societal concerns, the ICRP must carefully consider all available data and past experiences. Current risk models, such as the Linear No-Threshold (LNT) model, indicate a proportional increase in cancer risk with radiation exposure, making any potential changes a complex and highly scrutinized issue.
**Q:** What is the population base for threshold doses that cause symptoms with clinical abnormalities (doses affecting 1% of people)? What is the effective number of affected individuals?
A: A concrete figure cannot be provided, as the estimation is based on epidemiological studies. These studies analyze data from exposed populations to determine dose-response relationships, but variations in individual susceptibility and study methodologies make it difficult to specify an exact number.

*Junior expert's feeling /opinion:*

This lecture is comprehensive and systematic, covering the core concepts of radiation epidemiology, research methods, risk assessment, and case analysis. It incorporates classic studies on Hiroshima and Nagasaki atomic bomb survivors, nuclear facility workers, and other key research, providing authoritative data support. Using ERR and EAR models along with DS02 dose assessment, it precisely analyzes dose-response relationships and explores the health effects of low-dose radiation as well as cutting-edge biological mechanisms. The lecture is both academically rigorous and practically relevant, while also demonstrating a deep consideration of research ethics.

| | |
|---|---|
| **Junior expert name** | **Yifan SHI** |

| Date | **Lecture no** | Lecturer |
|---|---|---|
| Mar. 4th, 2025 | **4** | Assist Professor Harith AL-AZRI |
| Theme | Nuclear physics, radiation physics and chemistry | |

*Main contents of the lecture:*

Professor Harith Al-Azri began by elucidating the distinctions between chemical and nuclear reactions. He then provided an in-depth analysis of the band of stability, supplemented with several figures that demonstrated the proton-neutron combinations leading to stable isotopes and the various decay possibilities. Subsequently, he addressed a number of crucial topics, including nuclear binding energy, radioactivity units, the exponential decay equation, and the mechanisms of different decay types. These complex concepts were explained in simple terms, and participants were guided through exercise demonstrations involving calculations and problem-solving, enhancing their understanding of the material.

*Participant's response (Q/A):*

None

*Junior expert's feeling /opinion:*

Nuclear physics and radiation physics are indeed challenging subjects. It was truly impressive how Professor Harith Al-Azri managed to simplify these complex concepts for us. In the final session, I was particularly struck by his use of the gold isotope (Au-198) to illustrate the calculations of the decay constant, decay probability, and radiation activity over specific masses and timeframes. This method of starting with theoretical explanations and following up with practical exercises not only made the lecture more engaging but also significantly enhanced our comprehension. The once-elusive concept of "nuclear binding energy" became much clearer to me, thanks to the professor's illustrative figures and detailed explanations, just as it did for the other participants.

| **Junior expert name** | **Changting GUH** |
|---|---|

| Date | **Lecture no** | Lecturer |
|---|---|---|
| 4/3/2025 | **5** | Dr. Phannee SAENGKAEW & Dr. Kamontip PLOYKRACHANG |
| Theme | Radiation Measurement & Detection | |

*Main contents of the lecture:*

Dr. Saengkaew and Dr. Ploykrachang addressed radiation measurement and detection, focusing on naturally occurring radioactive materials (NORM) under risk management and communication. They explained different types of radiation, interactions with matter, and energy loss mechanisms, emphasizing the importance of understanding stopping power, linear energy transfer (LET), and ionization processes. The lecture introduced various radiation detectors, including gas-filled detectors (ionization chambers, proportional counters, and Geiger-Müller counters), scintillation detectors, and semiconductor detectors. The principles of radiation detection, including charge conversion and energy spectrum analysis, were thoroughly discussed. A practical demonstration of radiation detection methods provided insights into the efficiency of different detectors.

*Participant's response (Q/A):*

The participant asks what type of radiation detector provides the best energy solution. And the answer is the semiconductor detector, specifically the High-Purity Germanium (HPGe) detector, providing the best energy resolution among radiation detectors. Energy resolution refers to a detector's ability to distinguish between radiation energies that are close in value. It is usually measured as the full width at half-maximum (FWHM) of a spectral peak. HPGe detectors have excellent collection efficiency because the electron-hole pairs generated by ionizing radiation in Germanium crystal are collected with minimal recombination. This results in sharp, well-defined peaks in the detected energy spectrum. Germanium has a smaller bandgap compared to silicon, meaning less energy is required to create an electron-hole pair. This leads to number of charge carriers per unit of absorbed energy, improving signal quality, energy resolution.

*Junior expert's feeling /opinion:*

As an advanced-level lecture, instructing the participants on radiation measurement and detection strategies was insightful. The discussion on types of radiation, interaction with matter, and detection techniques provided a comprehensive understanding of radiation monitoring. The applications of radiation detectors, including gas-filled detectors, scintillation detectors, and semiconductor detectors, were particularly valuable in grasping the principles of radiation detection. The explanation of the interaction of radiation with matter, covering ionization, excitation, and energy transfer processes, helped participants understand how different radiation types affect various materials.

| **Junior expert name** | **Xueqing WANG** |
|---|---|

| Date | **Lecture no** | Lecturer |
|---|---|---|
| March 5th, 2025 | **6** | Prof. Hiroshi YASUDA |
| Theme | Advanced understanding of radiation units<br>-Protection from various radiation sources- | |

*Main contents of the lecture:*

In his lecture, Professor Yasuda covered three significant topics. Firstly, he discussed the "variety of doses," using examples of cell repair, death, and mutation to explain the differences between stochastic and deterministic effects of radiation exposure. Secondly, he introduced the concept of "biological dose," where he utilized the linear energy transfer (LET) concept to elucidate relative biological effectiveness (RBE). He highlighted that even if two radiations have the same combination, the RBE can vary across different tissues and organs. Lastly, he explained the "effective dose," demonstrating the calculation formula that incorporates tissue weighting factor, radiation weighting factor, and absorbed dose. He also presented a table showing the varying susceptibilities to radiation among different organs across various age groups.

*Participant's response (Q/A):*

During the lecture, Professor illustrated an incident in Peru involving Ir-192, where the patient's condition rapidly deteriorated due to initial misdiagnosis by the doctor, who mistook the symptoms for a bug bite. When participants inquired about alternative actions that could have improved the outcome, the Professor emphasized the importance of immediately moving the patient to an isolated room to prevent wound infection.
In response to another participant's question about the unit of RBE (Relative Biological Effectiveness), the Professor explained that RBE is dimensionless. This is because in the RBE calculation, both the numerator and denominator share the same unit (Gy), which cancels out during the division.

*Junior expert's feeling /opinion:*

In my humble opinion, Professor's lecture content was both essential and insightful. It encompassed some of the most fundamental topics in radiology, such as stochastic effects, deterministic effects, and the calculation formula for converting absorbed dose to effective dose. Moreover, the lecture extended beyond these fundamental concepts, introducing deeper ideas in a simple manner. For example, in addition to the fundamental tissue weighting factors, Professor explained that the susceptibility of the same tissue or organ to radiation can change over time as a person ages. This lecture style, which begins with fundamental concepts and progresses to more complex ones, proved to be highly effective.

| **Junior expert name** | **Changting GUH** |
|---|---|

| Date | **Lecture no** | Lecturer |
|---|---|---|
| 5/3/2025 | **7** | Dr. Md. Mahamudul HASAN |
| Theme | DOSIMETRY AND DOSE ESTIMATION<br>a practical discussion under the framework of natural radiation | |

*Main contents of the lecture:*

Dr. HASAN addressed dosimetry and dose estimation under the framework of natural radiation, with a particular focus on radon-based dose calculation and lung dosimetry. He discussed the importance of accurate dose determination for radiation protection, nuclear medicine, and therapy, emphasizing the complexity of dosimetry calculations due to the cascade of energy deposition events. Dr. HASAN explained the concepts of absorbed dose, equivalent dose, and effective dose, referencing ICRP Publication-103 for radiation and tissue weighting factors. Dr. HASAN also shared his eight-year efforts in Bangladesh, focusing on high radiation background areas and the systematic survey of radon, thoron, and gamma radiation to calculate population-based internal and external doses. He discussed the challenges in selecting representative values for dose calculation equations and the impact of lifestyle and seasonal variations on dose estimation.

*Participant's response (Q/A):*

As the first question, for prediction model, what are the accuracy and error compared to real experimental or previous studies? Dr. HASAN answered that dosimetry involves complex calculations due to the cascade of energy deposition events. This complexity can introduce uncertainties. The accuracy of dose estimation models relies heavily on the quality of input data, such as radionuclide levels, lifestyle factors, and exposure time. For example, in the case of radon dose calculation, factors like the equilibrium factor, aerosol characteristics, and breathing rate are critical. Also, the question asked what the difficulties are in calculating doses from natural radiation. The answer is Choosing appropriate representative values for parameters like radon concentration, equilibrium factor, and breathing rate is difficult due to their variability across different environments and populations. The methods recommended by the ICRP are often based on data from developed countries, which may not fully account for the unique environmental and lifestyle conditions in Bangladesh. Measurement uncertainties arise from seasonal variations, instrument calibration, and the duration of data collection.

*Junior expert's feeling /opinion:*

The lecture provided a comprehensive overview of dosimetry methods, focusing on the quantitative determination of deposited energy and its implications for radiation protection, nuclear medicine, and therapy. The practical discussion on natural radiation, particularly radon-based dose calculation using lung dosimetry. A significant portion of the lecture was dedicated to practical dose calculation, particularly in the context of natural radiation from radon. The inclusion of detailed discussions on measurement techniques, lifestyle factors, and environmental parameters provided a holistic understanding of dose estimation.

| **Junior expert name** | **Xueqing WANG** |
|---|---|

| Date | **Lecture no** | Lecturer |
|---|---|---|
| 05/03/2025 | **8** | Assoc. Prof. Kok Siong KHOO |
| Title | Radiation protection in safety and security | |

*Main contents of the lecture:*

Assoc. Prof. Kok Siong Khoo's lecture covered key aspects of radiation protection, including justification**,** optimization (ALARA), and dose limitation (20 mSv/year for workers, 1 mSv/year for the public). He emphasized safety and security through engineering controls, PPE, monitoring, and strict access controls. For emergency preparedness and waste management, he highlighted mitigation, evacuation, and deep geological storage. He also discussed technological innovations like AI, IoT, and nanotechnology for enhanced safety. Lastly, he stressed lessons from Fukushima and Chernobyl**,** reinforcing adherence to IAEA regulations for global safety.

*Participant's response (Q/A):*

Q: The occupational exposure limits are 20 mSv per year on average over 5 years and 50 mSv in any single year**.** If the cumulative dose reaches 250 mSv over 5 years and exceeds 100 mSv**,** what actions should be taken?
A: If the cumulative dose reaches 50 mSv per year**,** the exposed individual must report to the Radiation Protection Officer (RPO) for investigation**.** They should undergo a medical check-up and a biological environment assessment to evaluate their condition. If they are in a common zone**,** they should be relocated to a safer environment to minimize further exposure. The annual dose limit of 50 mSv is set to control the risk of stochastic effects, such as cancer. This is a great discussion point, and the related topics will be further explored in next week's lecture.

*Junior expert's feeling /opinion:*

This presentation is well-structured and logically rigorous, beginning with the definition and significance of radiation protection before gradually transitioning to key areas such as biological effects, protection principles, dose calculation, safety standards, risk management, and emergency response. It covers core concepts including the ALARA principle, time-distance-shielding strategy, dose calculation methods, and international safety standards. Additionally, the inclusion of practical cases, such as occupational dose calculation, shielding attenuation calculation, transport index calculation, and evacuation time estimation, enhances the applicability of theoretical knowledge, allowing the audience to better understand radiation protection measures in a more intuitive way.

| **Junior expert name** | **Yifan SHI** |
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| Date | **Lecture no** | Lecturer |
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| 10/3/2025 | **9** | Dr. Yu IGARASHI |
| Theme | Radiation protection in planned and emergency exposure situation | |

*Main contents of the lecture:*

Dr. IGARASHI addressed radiation protection in planned and emergency exposure situations, focusing on the categorization of exposure scenarios and the principles of protection. He explained the different exposure situations, including existing, planned, and emergency exposures, and discussed the phases of large nuclear accidents, such as the early, intermediate, and long-term phases. Dr. IGARASHI highlighted the importance of reference levels and dose limits in planned exposure situations, emphasizing the need for optimization of protection. He also provided a case study on the Fukushima nuclear accident, detailing the transition between phases and the corresponding protective actions. The lecture concluded with the fundamental principles of radiation protection: justification, optimization, and the application of dose limits.

*Participant's response (Q/A):*

As the first question, the 250 mSv is the temporary dose limit that radiation workers may face during the early phase (Early phase) of a nuclear accident. Specifically, it is the maximum radiation dose that workers are allowed to receive for a short period of time in an emergency to protect their lives or to avoid a greater catastrophe. Participants asked if Japan would remove this standard, since it is not in the early stages anymore. The answer was that in the long-term phase, the annual dose to radiation workers is limited to 50 mSv/y and the cumulative dose over five years must not exceed 100 mSv. Also, there were second question asked how the Japanese government work did to ensure radiation protection for workers after the Fukushima nuclear accident. The answer was Japanese government implemented several measures to ensure the radiation protection of workers, although not all government-level actions are fully transparent. Companies involved in the cleanup and containment efforts have taken significant steps to protect workers from radiation exposure.

*Junior expert's feeling /opinion:*

The lecture on radiation protection in planned and emergency exposure situations, delivered by Dr. Igarashi, provided a comprehensive overview of exposure categories, including existing, planned, and emergency situations. The discussion highlighted the importance of reference levels and dose limits, particularly in the context of nuclear accidents, using the Fukushima incident as a case study. Dr. Igarashi effectively explained the phases of a large nuclear accident—early, intermediate, and long-term—and their implications for radiation protection. The lecture emphasized fundamental principles such as justification, optimization, and dose limits, which are crucial for managing exposure in both planned and emergency scenarios. The practical approach to understanding these concepts, combined with real-world examples, made the lecture highly informative and engaging.

| **Junior expert name** | **Xueqing WANG** |
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| Date | **Lecture no** | Lecturer |
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| 10/03/2025 | **10** | Prof. Takumi SAITO |
| Title | Radiation Protection for Radioactive Wastes | |

*Main contents of the lecture:*

Assoc. Prof. Takumi Saito's lecture covered key aspects of radiation protection for radioactive waste. He introduced the nuclear fuel cycle and waste classification, emphasizing that spent fuels in Japan are considered resources rather than waste. He discussed radioactive waste management, highlighting strategies to minimize waste generation, stabilize disposal, and reduce radiation exposure. In radiation protection, he addressed both the operational period, where safety measures align with regular nuclear facilities, and the post-closure period, ensuring long-term environmental and human protection through containment and geological isolation. He also explored safety assessments emphasizing importance of public safety perception, acknowledging challenges in risk communication.

*Participant's response (Q/A):*

Q: IAEA GSG-1 didn't define the specific figure for the classification of radioactive wastes; how did Japan define the specific figures.
A: Each country can adopt the IAEA guidelines and set its own specific limits. In Japan, these limits are established through comprehensive safety assessments and are closely tied to disposal concepts to ensure long-term safety and regulatory compliance.
Q: You mentioned that certain types of storage require attention to duration, heat removal, and hydrogen countermeasures. What do you mean by these three steps?
A: Some types of radioactive waste, such as high-level waste (HLW), generate heat, so it is necessary to remove the heat to ensure safe storage. If the waste contains water, it must be properly managed, as water can lead to hydrogen generation through radiolysis. To prevent hydrogen accumulation, appropriate countermeasures—such as using specially designed waste packages with ventilation or hydrogen-absorbing materials—are required. The specific packaging and safety measures depend on the type of waste and storage conditions.

*Junior expert's feeling /opinion:*

The lecture is well-structured and logically rigorous, covering key concepts of radioactive waste management and radiation protection. It combines theoretical analysis with real-world cases, making the content more intuitive. Additionally, it explores interdisciplinary topics like safety assessment, geological barriers, and risk perception, highlighting the complexity and scientific aspects of nuclear waste management. The lecture also emphasizes the importance of risk communication and public awareness, making it highly relevant in practice.

| **Junior expert name** | **Yifan SHI** |
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| Date | **Lecture no** | Lecturer |
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| March 10th, 2025 | **11** | Prof. Takeshi IIMOTO |
| Theme | Radiation protection in existing exposure situation | |

*Main contents of the lecture:*

In the lecture, Professor IIMOTO thoroughly explained why the existing exposure situation chose the range of 1 to 20 mSv/y. Scientifically, it has been found that if exposed to radiation exceeding 1 Sv over a lifetime, the risk of cancer significantly increases. Assuming a radiation worker has a career span of 50 years, their annual exposure must not exceed 20 mSv on average to keep their lifetime exposure below 1000 mSv.
Furthermore, Professor IIMOTO offered insightful perspectives on: (i) The challenges in defining NORM occupational exposure. (ii) The turning point from NORM to TENORM. (iii) The updated ground average radiation dose reported by UNSCEAR, which increased from 2.4 to 3.0 mSv/y. (iv) The similarity between TENORM and decontaminated soil resulting from the Fukushima accident.

*Participant's response (Q/A):*

In the Q/A session, Professor IIMOTO thoroughly addressed a question from the participants regarding the Japanese Government's allowance for radiation workers involved in Fukushima decontamination to be exposed to radiation levels as high as 100 mSv/y, compared to the 50 mSv/y upper limit recommended by the ICRP. Professor IIMOTO explained that the core guideline is to ensure that lifetime exposure remains below 1000 mSv.
In addition to that, Professor IIMOTO also encouraged participants to consider how the decontamination threshold of 0.23 μSv/h (set by the Japanese Government) should be applied to areas with high natural background radiation.

*Junior expert's feeling /opinion:*

Professor IIMOTO's lecture was both insightful and informative. The definitions of the three exposure situations—planned, existing, and emergency—were explained with great clarity. The structure of the lecture was impressive, starting with the question "Why 20 mSv/y?" and concluding with the explanation, creating a cohesive narrative. The logical progression of the lecture, especially when addressing why controlling NORM occupational exposure is challenging due to various work categories, dose levels, and radiation source characteristics, made the content highly engaging. Such a well-organized and thoughtful lecture undoubtedly leaves a deep impression on the audience and facilitates profound learning.

| **Junior expert name** | **Changting GUH** |
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| Date | **Lecture no** | Lecturer |
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| 11/03/2025 | **12** | Asst. Prof. Zachariah John BELMONTE |
| Title | Risk Communication in RP | |

*Main contents of the lecture:*

Asst. Prof. Zachariah John Belmonte's lecture focused on risk communication in radiation protection, highlighting its role in public education, emergency management, and policymaking. He explained that risk perception is subjective, influenced by emotions, biases, and individual experiences rather than scientific probability. Effective risk communication requires transparency, credibility, and an understanding of audience concerns, particularly across different generations. He highlighted best practices, including proactive engagement, tailored messaging, and multi-channel communication. Finally, he discussed putting these practices into action, stressing conflict resolution, stakeholder collaboration, and the importance of clear, consistent messaging to build public trust.

*Participant's response (Q/A):*

Q: The main audience of my research is students. How should we decide what to say and how to say? Should we show them the dark side of nuclear science?
A: It is crucial to start with the history of radiation science, focusing more on its benefits. There is a lesson we have learned, and we continue to progress, making things better and better. Engagement in the field of radiation science is essential as well. It is important not to focus only on the dark side—radiation is now much safer, and discussions should provide a balanced perspective.

*Junior expert's feeling /opinion:*

This lecture is highly informative and well-structured, providing a comprehensive and insightful exploration of risk communication in radiation protection. It effectively integrates theoretical foundations with real-world applications, offering practical strategies for enhancing public understanding and trust. The discussion on cognitive biases and risk perception is particularly valuable, as it helps bridge the gap between scientific assessments and public concerns. Additionally, the lecture excels in addressing intergenerational communication differences, making it adaptable to diverse audiences.

| **Junior expert name** | **Yifan SHI** |
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| Date | **Lecture no** | Lecturer |
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| 3/11/2025 | **13** | Dr. Akihiro SAKODA |
| Theme | Radiation Protection for Naturally Occurring Radioactive Materials (NORM) | |

*Main contents of the lecture:*

Dr. Sakoda began his presentation by discussing Naturally Occurring Radioactive Materials (NORM), focusing on commonly studied radionuclides, exposure pathways, and the challenges in applying radiation protection measures, particularly in relation to occupational exposure and radon exposure. He then outlined key industries where NORM-related exposure could affect workers, the public, and the environment. This was followed by an explanation of the protection principles for managing NORM in industrial processes, emphasizing a graded approach. Dr. Sakoda also highlighted radon exposure as a significant public health concern due to its potential risks. He suggested that modern construction practices, including the use of measurement devices and radon prevention strategies, could effectively monitor and mitigate indoor radon accumulation. Furthermore, he noted that the radon program has garnered attention and involvement from a wide range of stakeholder groups.

*Participant's response (Q/A):*

One question has been asked: while ignoring high background radiation level and waste management, what could be an example of industries which cause higher level of NORM exposure or worders in the industries receiving high level of exposure. Dr. Sakoda claimed that the exposure level of an industry could be different depending on many factors including geology. Exposure situation should be considered case by case.

*Junior expert's feeling /opinion:*

This lecture addressed a significant and complex topic: NORM (Naturally Occurring Radioactive Materials). The presentation provided a clear and structured overview of NORM and its associated radiation protection concepts, offering participants valuable insights into the current social and regulatory priorities regarding NORM exposure. Additionally, the lecture covered radon risks, presenting well-established radiation protection principles and effective countermeasures. Given the breadth of NORM-related issues and the depth of radiation protection concepts, it is evident that this lecture could only scratch the surface. I believe there will be further discussions and explorations of NORM in the future, as the topic demands more extensive attention beyond the constraints of this single session.

| **Junior expert name** | **Qianhao JIN** |
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| Date | **Lecture no** | Lecturer |
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| 24/3/2025 | **14** | Dr. Tatsuhiko OGAWA |
| Theme | Analytical understanding of radiation behavior | |

*Main contents of the lecture:*

Dr. Ogawa delivered a lecture on the analytical understanding of radiation behavior, focusing on radiation transport analysis. He introduced fundamental concepts related to radiation pathways, transport mechanisms, and shielding materials. Dr. Ogawa emphasized the Monte Carlo method as a crucial tool for radiation simulations. He detailed its historical development, principles, and applications in various fields, including nuclear reactors, medical therapy, and space radiation studies. Practical exercises involved radiation transport calculations using PHITS, illustrating dose estimation techniques. Additionally, he discussed the integration of Monte Carlo simulations in modern computational frameworks, optimizing large-scale radiation assessments. He then spent a great deal of time on hands-on exercises to guide PHITS. Specifically, he explained exactly how to edit the section of source, material, surface, cell, T-Track etc. in PHITS to make them work.

*Participant's response (Q/A):*

Due to the different coding habits of each participant, in the actual training of teaching PHITS, participants will encounter many problems in the process. For example, how to see the 3D version of the created graphic, how to change the coordinates, how to change the size of the object, and so on. Dr. Ogawa gave one-on-one explanations on all of them and gave targeted suggestions on how to modify the code as well as ways to improve the efficiency of the operation. For the participants, this was their first time utilizing PHITS and the learning effect was remarkable.

*Junior expert's feeling /opinion:*

As an advanced-level lecture, instructing the radiation transport simulation strategies to the participants was highly insightful. The practical exercise by Dr. Ogawa using PHITS was very effective in understanding the radiation behavior and dose estimation methodologies. This approach to teaching complex radiation transport analysis could also be beneficial for developing other advanced training programs in radiation safety and shielding. Dr. Ogawa highlighted key theoretical and practical aspects in each section of his lecture, which was a valuable technique to enhance participants' understanding of radiation interactions and simulation methods.

| **Junior expert name** | **Xueqing WANG** |
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| Date | **Lecture no** | Lecturer |
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| 27/3/2025 | **15** | Dr. Anita ABD RAHMAN |
| Theme | Integration of thinking with other disciplines related to risk management -Medical Risk - | |

*Main contents of the lecture:*

Dr. Rahman delivered a lecture emphasizing the importance of understanding medical risks and hazards, the necessity of risk management, and its impacts on both patients and healthcare workers. The primary purpose of recognizing medical risks and hazards is to identify potential threats—including situational factors and their probabilities—that could compromise patient health and safety in clinical settings. With this understanding, early prevention strategies can be implemented, establishing essential systems for proactively identifying, assessing, and mitigating risks to maintain a safe environment. Effective risk management practices play a crucial role in preventing adverse events, thereby improving the overall quality of patient care while safeguarding the health, safety, and well-being of healthcare workers.

*Participant's response (Q/A):*

None.

*Junior expert's feeling /opinion:*

As an advanced-level lecture, it comprehensively outlined the risk management process in medical settings, covering key approaches, procedures, and practical applications in related operations. The discussion highlighted common medical risks, such as radiation exposure, and presented adaptable, evidence-based strategies for effective risk management in Nuclear Science and Technology (NST) and allied fields. Furthermore, the lecture emphasized the critical role of cross-disciplinary thinking in radiation risk management, demonstrating its significance for real-world radiation protection practices.

| **Junior expert name** | **Qianhao JIN** |
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| Date | **Lecture no** | Lecturer |
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| 27/03/2025 | **16** | Dr. HAYASHI |
| Theme | Integration of Thinking with Other Disciplines Related to Risk Management<br>-Chemical Risk- | |

*Main contents of the lecture:*

Dr. Hayashi began the lecture by explaining foundational of chemicals concepts, illustrating their diverse applications through examples of historically renowned figures. She detailed various chemical hazards, affecting both health and the environmental, by recounting several real-world incidents. To enhance participants' comprehension of typical chemical hazard labels, Dr. Hayashi introduced the hazard pictograms that are integral to the international Globally Harmonized System of Classification and Labelling of Chemicals (GHS). These pictograms serve as standardized symbols to communicate specific hazards associated with chemical substances. In conclusion, Dr. Hayashi outlined practical strategies to mitigate chemical hazards and safeguard individuals when handling different types of chemicals. Key recommendations included blocking the four major routes of chemical exposure and diligently reading labels prior to chemical use.

*Participant's response (Q/A):*

In this lecture, there is no question from the participant's side.

*Junior expert's feeling /opinion*

This lecture evoked memories of my undergraduate studies in safety engineering, particularly concerning the chemical industry, by providing a deep exploration of chemical risks. It effectively structured the concepts of chemical risk and safety management, utilizing multiple examples to analyze and illustrate key points. This approach enhanced understanding for all participants, including those with limited prior knowledge of chemical risks.

| Junior expert name | Hanting LI |
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| Date | **Lecture no** | Lecturer |
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| 27/03/2025 | **17** | Ai SHUHARA |
| Title | Integration of thinking with other disciplines related to risk management – general risk - | |

*Main contents of the lecture:*

Asst. Prof. Ai Shuhara's lecture systematically explored risk management. She began by explaining that risk is the effect of uncertainty on objectives and introduced core principles of risk management. She then introduced practical methods for identifying risks in everyday life, such as observation, experience, data analysis, and intuition. To support decision-making, she demonstrated how to analyze and prioritize risks using impact-likelihood matrices. In discussing risk response strategies, she outlined four approaches: avoidance, mitigation, sharing, and acceptance, while also warning against common cognitive biases. Finally, she stressed the importance of continuous monitoring and adaptation, encouraging the application of risk thinking to long-term aspects/plannings.

*Participant's response (Q/A):*

Q: How can we justify a situation where the likelihood is low, but the impact is high?
A: It depends on the person and what you feel like. To make it easier to understand, you can simplify and categorize the information and focus on what you want to highlight. The way the calculation is done can be different depending on the person.
Q: When using the metrics, is there any clear definition or standard so that anyone can apply it easily?
A: You can categorize the metrics by yourself, depending on your purpose or context. For example, in the case of earthquakes, a five-by-five matrix can be used to assess risk levels. Often, the categorization is based on observation data and statistics, but ultimately, it depends on your own judgment and how you choose to define and apply the metrics.
Q: How do you define the Fukushima incident in terms of risk assessment?
A: In my personal opinion, the impact of Fukushima was quite high. The person in charge should have conducted a proper evaluation, but the combined effects of the two disasters were not fully considered. It's important to evaluate such events in combination with related natural risks to better understand the overall impact.

*Junior expert's feeling /opinion:*

This presentation by Asst. Prof. Ai Shuhara is well-structured and logically coherent, effectively connecting the abstract concepts of risk management with practical aspects of daily life. It is both highly applicable and thought-provoking. This clear and accessible presentation successfully integrates theory and practice, making it suitable for both beginners and more experienced learners looking to refine their decision-making systems.

| **Junior expert name** | **Yifan SHI** |
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