2nd Caesium Workshop: meeting challenges for Fukushima recovery

Unix-Building/Fukushima/Japan
October 6th - October 9th, 2014
(Organised by JAEA)

Background and objectives

Environmental remediation work following the Fukushima accident has been gradually progressing, but there still remain some challenging issues: e.g., responding to forest contamination, management of waste and soil contaminated with radioactive materials, future radiocaesium (Cs) migration. The first international Cs workshop, held in Fukushima on September 30th - October 3rd, 2013, was of great general interest and gathered international expertise relevant to restoration of Fukushima, including technology transfer from similar past experiences around the world, state-of-the-art research and development on technology for volume reduction of waste and soil together with the management of untreated forests.

Following this successful 1st workshop, the objectives of the 2nd workshop held this year are to integrate and share recent developments in Fukushima restoration, identify key *challenging issues* and discuss how to face them. The specific topics of this workshop are: status of investigations and modelling Cs migration in the environment, volume reduction of waste and soil – including safe storage of contaminated materials with a focus on organic effects, communication issues with a focus on reuse of slightly contaminated materials and related special issues where communication plays a key role including, tritium management and revitalisation of the forest industry.

Each presentation is allocated 40 minutes (25 minutes for presentation, 15 minutes for discussion) and the timings must be strictly adhered to. The important points of each presentation are described by way of a list of bullet points.

Brief agenda - main items:

October 6th - 9:00-17:00

Welcome addresses:

9:00~9:30   Welcome and introduction (JAEA: Y. Moriyama)
          Welcome address (MEXT: R.Nishida)
          Welcome address (Fukushima Office for Environmental Remediation, T.Sekiya)
          Welcome address (Fukushima Prefectural Government, N. Kanno)

Session 1: Objectives
(Chair, M. Yui, Facilitator, I. McKinley)

Outline: In order to accelerate the restoration of the Fukushima prefecture and to allow evacuated residents to return to their homes as quickly as possible, we have to face a number of serious challenges during remediation activities. In particular, there is great concern from the public regarding forest management, treatment of the huge volume (around 28 million m^3) of contaminated material resulting from decontamination activities and prediction of future radiocaesium movement in the environment.

9:30~10:10 Objectives of the workshop and overview of remedial actions and the management of waste and soil in Fukushima (Dr. Mikazu Yui, JAEA)
- Background and status of off-site Fukushima remediation and management of waste and soil
- Overall goals of workshop
- How to decontaminate and how to treat produced contaminated materials to achieve volume reduction?
- How to assess Cs movement and its future effects on the environment?
- How can public acceptance be gained?
- What can scientists do to better address these concerns?

10:10~10:30 Break

Session 2: Cs migration investigation and restoration of agricultural land
(Chair, K. Iijima, Facilitator, I. McKinley)

Outline: The F-TRACE project is actively producing data that is building an understanding of radio-Cs mobility within the Fukushima area. The field investigations on Cs migration, studying transport between the forest ~ river ~ reservoir (dam, lake) and estuary systems, are necessary to enable long-term prediction of any potential mobilisation and also assess countermeasures to mitigate any potentially deleterious effects due to Cs transport. The status and QA for various types of measurements will be presented and future work areas identified. For example, lowering the detection limit of Cs-137 and technology for particulate collection/filtration devices installed at dam outlets (as Cs transport countermeasures) will be presented. Finally, various technologies and activities for the restoration of agricultural land will be presented.

10:30~11:10 Remote sensing technology in use in the Fukushima area (Prof. David Sanderson, SUERC)
- Remote sensing technology already used in the Fukushima area, in particular forested areas
- Needs for integration, intercalibration and interpretation of forest Cs evolution
- Plans for future actions
- Assuring easy access to remote sensing output
- Ideas for future development to meet Fukushima challenges

11:10~11:50 Progress within the F-TRACE Project (Dr. Tadafumi Niizato, JAEA)

- Background to the F-TRACE research programme
- Difficulties encountered (boundary conditions e.g. restriction of movement of samples and standards)
- Results of F-TRACE investigations (lake, river, estuary, lichen, forest)
- Interpretation and modelling
- Future directions for F-TRACE research
- How F-TRACE research contributes to return of displaced residents

11:50~12:30 Investigation of Cs migration and accumulation at a catchment scale (Dr. Seiji Hayashi, NIES)

- Background to the NIES research programme
- Results of Cs migration investigations
- Interpretation (e.g. hot spot formation) and modelling
- Future directions of Cs migration research
- How NIES research contributes to return of displaced residents

12:30~13:30 Lunch

13:30~14:10 Status of Cs migration studies at University of Tsukuba (Prof. Yuichi Onda, University of Tsukuba)

- Background to University of Tsukuba radiocaesium research programme
- Results of investigations (forest, soil erosion, river)
- Interpretation and modelling
- Future directions of Cs migration research
- How research contributes to return of displaced residents

14:10~14:50 Status of Cs migration studies at Institute of Environmental Radioactivity, Fukushima University (Prof. Kenji Nanba, Fukushima University)

- Background to Fukushima University radiocaesium research programme
- Biochemical and microbial mechanisms that retard or promote Cs migration
- Results of field research in various environmental compartments (lake, river, estuary, forest)
- Interpretation and modelling
- Future directions of Cs migration research
- How research contributes to return of displaced residents

14:50~15:30 Radiocesium transfer factor for agricultural plants in Fukushima (Dr. Sadao Eguchi, NIAES)

- Background to the NIAES research programme
- Importance of transfer co-efficients for radiocaesium in agricultural plants
- Experimental design
- Results and implications for plant-human dose pathways
- Ideas for future development to meet Fukushima challenges

15:30~15:50 Break

15:50~17:00 Open discussion: Do we sufficiently measure and understand Cs migration?
Focused brainstorming using an argumentation model.

October 7th - 9:00-17:00

Session 3: Cs modelling benchmark exercise / test cases and related activities - contribution to remediation / agriculture support
(*Chair, A. Kitamura, Facilitator, I. McKinley*)

Outline: Quantitative models of Cs transport processes are required to extrapolate F-TRACE results in space and time, identify likely migration pathways (from forest to rivers and estuaries) and potential accumulation points (e.g. lake and dam sediments, riverbeds) and also to estimate radiation dose to local communities. The aquatic models that are the focus for this session also provide guidance for strategies for managing impacts to be developed, in particular for sensitive areas, such as farm land (which is often irrigated directly from rivers). In this way, models are powerful tools for planning Fukushima restoration and for such a purpose, model applicability / reliability must be determined.

9:00~9:40 Mathematical modeling of radiocesium transport through the subsurface environment, rivers, reservoirs, and watersheds for justification of post-accident countermeasures: experience of post Chernobyl studies and testing of the applicability to Fukushima conditions (Prof. Sergii Kivva, Ukraine National Academy of Science/Fukushima University)
- Modeling of radiocesium transport through the subsurface environment
- Modeling of radiocesium transport in surface water bodies
- Modeling of radiocesium redistribution in watersheds
- Testing the applicability/reliability of models for Fukushima conditions

9:40~10:20 Relating aquatic models to public concerns (Prof. Jim T. Smith, University of Portsmouth)
- Placing aquatic models in the context of integrated dose assessment
- Assessing doses from aquatic food chains ($^{134/137}$Cs and ^{3}H)
- Assessing impacts of counter-measures / lifestyle changes
- Testing applicability / reliability for Fukushima conditions
- Ideas for future development to meet Fukushima challenges

10:20~10:40 Break

10:40~11:20 JAEA Modelling of Cs transport within Fukushima aquatic systems(Dr. Hiroshi Kurikami, JAEA)
- Cs transport from land (forests) to the aquatic system – F-TRACE research interpretation
- Prediction of Cs transport through lakes, rivers and estuaries to the ocean
- Model verification
- Model validation – ideas for analogues
- Modellers requirements from environmental Cs research

11:20~12:00 NIES Modelling of Cs transport in terrestrial area around Fukushima (Dr. Yoshitaka Imaizumi, NIES)

- Cs transport from terrestrial to aquatic systems of the Fukushima prefecture
- Radiocaesium release rates to river estuaries and the ocean
- Model verification
- Model validation – ideas for analogues
- Modellers requirements from terrestrial and aquatic Cs research

12:00~13:00 Lunch

13:00~13:40 Radiocesium mobility in the "soil-water" system - underlying processes: looking at Fukushima from a Chernobyl perspective (Prof. Alexei Konoplev, Fukushima University)

- Radiocesium solid-liquid distribution in soil-water system
- Radiocesium wash-off and river transport
- River flood plain processes: accumulation and loss
- Irrigation ponds - critical water bodies?
- Monitored natural attenuation as a remediation option
- What we learned from post-Chernobyl and other post-accidental remediation practice

13:40~14:20 Ensuring measurements meet modellers' requirements (Dr. Helen Grogan, Risk Assessment Corporation, Cascade Scientific)

- What are the key measurements needed by the modellers?
- What quality controls are required?
- How do modellers provide feedback on the measurement database?
- How do the field teams provide feedback on the models?
- Ideas for future development to meet Fukushima challenges

14:20~15:00 Quality assurance in environmental geochemistry : delivering fit for purpose data (Prof. Rob Ellam, SUERC)

- Ensuring integrity of sample materials
- Coupling sampling to analytical strategy
- Maintaining analytical integrity
- Standardisation, certification and metadata
- Legacy big data, maximising technological advantage

15:00~15:20 Break

15:20~17:00 Discussion/brainstorming (model reliability, uncertainties, output for restoration)
Further focused brainstorming using the argumentation model.

October 8th - 9:00-17:40

Session 4a: Special issues with communication needs – tritiated water and forestry management
(Chair, G. MacKinnon/S. Nakayama, Facilitator, I. McKinley)

Outline: This session deals with tritium management and forest management/measures. Tritium management is a key challenge for on-site contaminated water treatment and requires realistic resolution based on state-of-the-art understanding of potential impacts on the Fukushima fishery industry and the technology supporting assessment of different management options. Forest management/measures should be optimised to mitigate concerns of the people living in forest areas, working in forestry and consuming forest products, with consideration of reviving the important Fukushima forest industry.

(Tritium management)

9:00~10:00 Status of contaminated water treatment and tritium at Fukushima Daiichi Nuclear Power Station (Dr. Noboru Ishizawa, TEPCO), successive English translation will accompany this presentation
- Summary of contaminated water management on-site
- Technical difficulties for tritiated water management
- Technical assessment for management options by the government task force

10:00~10:40 Tritium in the aquatic environment (Dr. Gillian MacKinnon, SUERC)
- Environmental sources of tritium
- Health significance of tritium in the environment
- Case studies: UK experience (Sellafield, Amersham chemical plant…)
- Public communication / stakeholder involvement (in particular fisheries)
- Transfer of Sellafield experience to Fukushima
- Discussion: lessons for Fukushima tritium management

10:40~11:00 Break

11:00~11:40 Managing large volumes of liquid waste (Dr. Wolfgang Kickmaier, MCM)
- Managing large volume sources of contaminated water (including non-radioactive)
- Overview of general experience in direct disposal of liquid waste on land (US and Russia)
- Direct release to ocean – international experience
- Pros and cons of management options proposed for tritium
- Discussion: lessons for Fukushima tritium management

(Forest management / measures)

11:40~12:20 Radiocesium contamination in forest ecosystems and wood (Dr. Shinta Ohashi, FFPRI)

- Overview of radiocaesium in Fukushima forests
- Temporal change of radiocaesium in wood of dominant tree species
- Radiocaesium distribution patterns in wood
- Discussion: lessons for Fukushima forest management

12:20~13:20 Lunch

13:20~14:00 Assessing radiocontamination in forest ecosystems (Prof. Pier Nimis, University of Trieste)

- Experience from distant Chernobyl contamination
- Sources of dose in forest ecosystems
- Special food-chain considerations
- Potential counter-measures for dose reduction
- Discussion: lessons for Fukushima forest management

14:00~14:40 Linking forest ecosystem models and measurements to management options (Dr. Alan Cresswell, Fukushima University)

- Contamination overview in Fukushima forests
- Concerns of the forestry industry
- Concerns of the local populace / users of forestry produce
- Integration of understanding to guide management options
- Discussion: lessons for Fukushima forest management

Session 4b: General communication issues, e.g. reuse of lightly contaminated radioactive materials
(Chair, K. Miyahara, Facilitator, I. McKinley)

Outline: Optimising forest, river and waste management (including storage, recycling and disposal) should involve the public in decision making, in an open, effective and timely fashion. Already in the 1st Cs workshop, this was identified as one of the biggest challenges for all those working on Fukushima recovery. How to improve / facilitate involvement of the public is discussed in this session, with assessment of any possible knowledge transfer based on foreign experience.

14:40~15:20 Special challenges for Fukushima and Japan (Prof. Julie West, BGS, Manchester University)

- International concerns resulting from Fukushima and similar incidents
- Concerns in Japan resulting from Fukushima
- Concerns of the local residents and cleanup workers
- Lessons learned from international experience
- Discussion: lessons for Fukushima communication

15:20~15:40 Break

15:40~16:40 Communication of radiation risks (Prof. Kyoko Oba, Tokyo Institute of Technology)
  Successive English translation will accompany this presentation
- Background to radiation risk communication research
- Status before the accident – demographics, public perception and understanding of radioactivity
- Status after the accident – communication and public perception and opinion
- Current status of risk perception communication and future directions - importance of integration of public needs and opinion with expert opinion

16:40~17:40 Discussion/brainstorming (how to involve the public in facing key challenges)
Further focused brainstorming headed up by a panel. Participants are: K. Miyahara, Prof. Oba, Prof. Julie West.

October 9th - 9:00-17:00
Session 5: Management of waste and contaminated soil - waste volume reduction technology and management of contaminated soil
(*Chair, S. Nakayama, Facilitator, I. McKinley*)

Outline: A holistic approach to the management of contaminated soil and waste from decontamination activities requires mechanistic understanding of the behaviour of Cs in relevant environmental materials, e.g., effects of organic matter, longevity of temporary stores, development of final recycling or disposal options. In any case, advanced Cs removal techniques/methodologies will be needed for optimisation of future decontamination, waste volume reduction and contaminated soil management activities.

9:00~9:40 Managing organic-rich material and soil from decontamination actions (Dr. Ian McKinley, MCM)
- Drivers for reducing waste volumes
- Assessing cost-benefit of different options
- Special challenges for organic waste
- Challenges for organic-rich soil
- Ideas for future development to meet Fukushima challenges

9:40~10:20 Research for development of soil separation technology (Dr. Shinzo Ueta, Mitsubishi Materials Corporation)
- Importance of separation technology
- Characteristics of soils to be treated
- Difficulties encountered and technological advancements
- Ideas for future development to meet Fukushima challenges

10:20~10:40 Break

10:40~11:40 Discussion/brainstorming (perspective of waste and soil storage issues especially volume reduction)

11:40~13:00 Lunch

Session 6: Final discussions and wrap-up
(Chair, K. Miyahara, Facilitator, I. McKinley)

13:00~15:00 General discussion
Further focused brainstorming using the argumentation model

15:00~15:20 Break

15:20~16:40 General discussion

16:40~17:00 Wrap-up/ Closing remarks