The latest news on environmental emergency research at the National Institute for Environmental Studies (NIES)

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Introduction of Our Laboratory Equipment

Material Cycle/Waste Treatment Demonstration Laboratory

In order to introduce the specific research we've been carrying out at the Fukushima branch to the readers, we will feature various equipment used in our laboratories in this and later editions of the newsletter. In this edition, we introduce demonstration equipment added to our Material cycle/ Waste treatment Demonstration Laboratory, which we featured in the October 2016 edition.

The Material Cycles and Waste Treatment Demonstration Laboratory has a compact rotary electric furnace and two lysimeter test sites. Employing this equipment, we perform research towards the practical application of incinerated waste and soil as manufacturing cement and the establishment of methods for safer interim storage and eventual final disposal in future.

Compact Rotary Electric Furnace

This is a parallelepiped rotary electric furnace with sides measuring about 50 cm. It is used for research to improve the efficiency of separating and concentrating radiocesium from contaminated waste and removed soil. By putting contaminated waste and removed soil together with a reaction accelerator such as limestone into the cylinder and heating it to 1300 ℃ , radiocesium gets separated from the waste and soil. The separated cesium, when cooled to normal temperature, returns to its solidified state and we can capture and recover it using a filter. In this experiment, we expect to establish a technological approach to efficiently remove radiocesium from removed soil and to utilize the decontaminated soil for cement ingredients.

Lysimeter

The Fukushima branch has two lysimeters with a size of width 2 m × height 2 m × depth 2 m. The photo on the right shows an artificial rainfall device placed on the lysimeter to be used for research on the storage and management of contaminated removed soil. We apply artificial precipitation on the removed soil, and monitor the seepage through the soil for radiocesium concentration, amounts of organic matter and fine particles, and the gas emissions from the soil. Please also see the "From the research front line" page in this edition.

At the Fukushima branch, we treat radioactive contaminated samples including radiocesium contaminated soil and waste in our laboratories. Safety is ensured by controlling the amount and radiation levels of samples carried in and by monitoring spatial dose. We do not use samples that greatly increase the spatial dose. We will carry out further research on potential technologies aimed at long term safe storage in interim facilities, effective utilization of removed soil, and volume reduction of contaminated waste and soil for eventual final disposal, hoping to contribute to safe radioactive waste treatment and storage in interim facilities from the aspect of science and technology. Please look forward to the fruits of our future research.

ShibuShibu-kun's advice!

Roles Resident Organizations Play in Environmental Restoration after Disaster

Takashi Tsuji, Researcher, Regional Environmental Renovation Section, NIES Fukushima Branch

Role of Resident Organizations at the Time of Disaster

People's connections within the local area are called community. The community manages the public goods of the area, such as forests and fisheries, and also carries out regional activities such as athletic meets and festivals, in order to enrich the lives of the residents. It is the resident organization that is at the core of the community.

Living in an area, we are involved with various resident organizations. They include organizations in which households of the area widely participate, such as neighborhood associations and self-governing associations; organizations responsible for education and child rearing, such as children's associations and PTAs; and organizations that are involved in the area's industry and employment, such as commerce and industry associations and agricultural cooperatives. All of these organizations have their role in regional activities.

When a disaster occurs, central and local governments responsible for administration become busy carrying out emergency responses including the relief of victims. In the marketplace, since logistics doesn't function well, the supply of goods and services becomes stalled, making the role played by the community very important. In particular, resident organizations serve as contact points for people coming from other areas, such as volunteer organizations, and distribute supporting supplies and the like to residents. They also play the role of collecting and summarizing the diverse opinions of the residents regarding restoration, interacting with organizations outside the region, and communicating the intent of the residents to the administration so that residents' opinions are well reflected in the policy.

Measures against Radioactive Material and Resident Organization in Miharu Town

After the occurrence of the Fukushima Nuclear Accident, the government designated areas with radioactive contamination as Intensive Contamination Survey Areas (ICSA). The residents there were allowed to stay, and the local governments formulated a decontamination plan for each municipality to show residents the policy of implementing decontamination. In these areas, based on radiation dose monitoring surveys by the national government (Ministry of the Environment, etc.) and prefectural governments, and upon guidelines for radiation protection and decontamination, municipal governments and residents together collected information related to measures against radioactive material, decided on decontamination methods, and implemented decontamination.

For example, in Miharu Town in Fukushima Prefecture, located approximately 45km from Fukushima Daiichi Nuclear Power Plant, a resident organization called the Town Development Association established a disaster headquarters in each administrative district immediately after the accident. When the Fukushima Prefecture announced the policy of providing resident organizations with financial support to carry out decontamination projects (for example, providing money to purchase high-pressure washing machines for the dose reduction activity support project), the administration of Miharu Town informed resident organizations, including the Association, administrative districts, and voluntary disaster prevention associations, of this policy. This is how resident organizations in the town came to conduct activities such as decontamination of school roads.


安心して暮らすため
除染を行っています

子どもたちの健康を最優先し、学校や保育所、幼稚園、公園から始まった除染対策は、通学路など、より身近な生活空間へと広がってきています。子どもたちをはじめ町民の皆さんが、1日も早く安心して暮らせる環境を取り戻すために、10月末から12月にかけて、各地区で除染作業が行われました。

各行政区の取組み

11月6日から12月18日にかけて、町内56の行政区や自治会が主体となって、県の除染低減化活動支援事業を活用して、通学路の除染作業が行われました。

土砂撤去後の高圧洗浄のようす

土砂を敷きしているようす

町議会議員の取組み

10月20日と11月8日に、町議会議員と町職員が除染作業を行いました。これは、PTAや地区の皆さんが事前に調査した通学路などで、1時間当たり2マイクロシーベルトを超える、比較的放射線量の高い通学路の放射線量の

除染作業終了後

除染作業中

Figure 1: Town News reporting the decontamination activities by resident (district) organizations [Source: News Miharu, No. 986, p. 5]

Also, since January 2012, when the Act on Special Measures concerning the Handling of Pollution by Radioactive Materials was fully implemented, the town administration came to a stage where they carry out an area-wide decontamination project (decontaminate all houses, roads etc. within a certain range of the area). At this stage, Town Development Associations took charge of determining the location of temporary storage space for radioactive contaminated waste generated by decontamination and managing the daily maintenance of the temporary storage space. There were even some Associations that set up committees or sections in charge of decontamination and temporary storage space management. The town administration designated the district with the highest radiation dose within the town as the model district. Since the town administration needed to quickly inform the entire Town of the methods of decontamination and provisional place management of the model district, they chose the resident organizations that are familiar with the local land use and residents composition of each district to be in charge of determining the location of the temporary storage space, etc.

As seen above, recovery of the environment such as the measures against radioactive substances after a disaster is not something to be carried out only by the administration and experts. In the event of a disaster, it is the resident organizations whose role can be very important.

Reference

(1) Tsuji T., Tajima R., Nakamura S., Oba M. (2017) Discussion on the issues of regional creation from a radiation disaster in mixed areas: A case study of Miharu Town, Fukushima Prefecture, Summaries of technical papers of annual meeting, Institute of Social Safety Science, 41, 87-90. (in Japanese)

Full-scale Monolith Lysimeter Experiment: Towards Safe Storage of Removed Soil

Kosuke Nakamura, Research Associate,
Radiological Contaminated Off-site Waste Management Section, NIES Fukushima Branch

Storage of Removed Soil at Interim Facilities towards Reconstruction of Disaster-affected Area

In the aftermath of the Fukushima Nuclear Accident, the radiocesium discharged from the nuclear plant contaminated the environment around the area, including the soil. The soil collected in the process of implementing decontamination measures (decontamination and other measures in accordance with a decontamination plan as stipulated in the Act on Special Measures concerning the Handling of Environment Pollution by Radioactive Materials) is termed "removed soil." The removed soil is now being kept at places such as temporary storage sites, residential grounds, and school yards. The transfer and safer storage of the soil from these sites to more appropriate places is an issue to be considered in the reconstruction and restoration of Fukushima. To this end, interim storage facilities are now being constructed.

Designing Safer Interim Storage Facilities

Once completed, interim storage facilities shall prevent removed soil from coming into contact with water. While construction is in progress, however, the removed soil in the pit is permeated with rainwater. The leachate from the landfilled removed soil is treated accordingly by its water quality and then discharged from the facility. The water quality varies depending on the properties and concentration of what it contains, such as radiocesium, soil organic matter derived from soil, iron and manganese that color the water brown or black, and other fine particles derived from soil. If we could know beforehand in experiments about the quality of leachate from removed soil, it would be useful in designing the capacity of the interim facility and methodology of the leachate treatment.

There are also cases of gasses excreted from microbes consuming soil organic matter. The gases include carbon dioxide, methane, and hydrogen sulfide, among others. If we could know beforehand in experiments about the content and concentrations of the gasses emitted from the soil, it would be useful in the development of technologies for controlling the gas generation and of measures for ensuring workers' safety.

An Artificial Precipitation Experimental Apparatus

We have two monolith lysimeters, which are rainfall-on-removed-soil-simulation experimental devices, in our demonstration laboratory in NIES Fukushima Branch (Fig. 1). The Lysimeter is a box shaped device, 2m wide by 2m long by 2m deep. We pack the removed soil into this container (1.5 m deep) and apply artificial precipitation to the soil, from which the seepage water will leach and flow into an underground tank. We analyze the water to gain data on its quality using various experimental devices. We also collect gasses generated through inserting tubes in the soil. We analyze and collect data on the content of the gasses using various experimental devices. To ensure that spatial radiation dosage is being kept at a low level, we cover the top surface of the removed soil in the container with radiocesium-free soil.

Use of Data Obtained from Full-scale Monolith Lysimeter

The experimental work of collecting water and gasses and analyzing the content is a considerable task, requiring at least five persons at work for one whole day. The data obtained will contribute to safer storage of the removed soil in the interim storage facilities. We will continue the monolith lysimeter experiments, with the hope of contributing to the restoration and reconstruction of Fukushima.

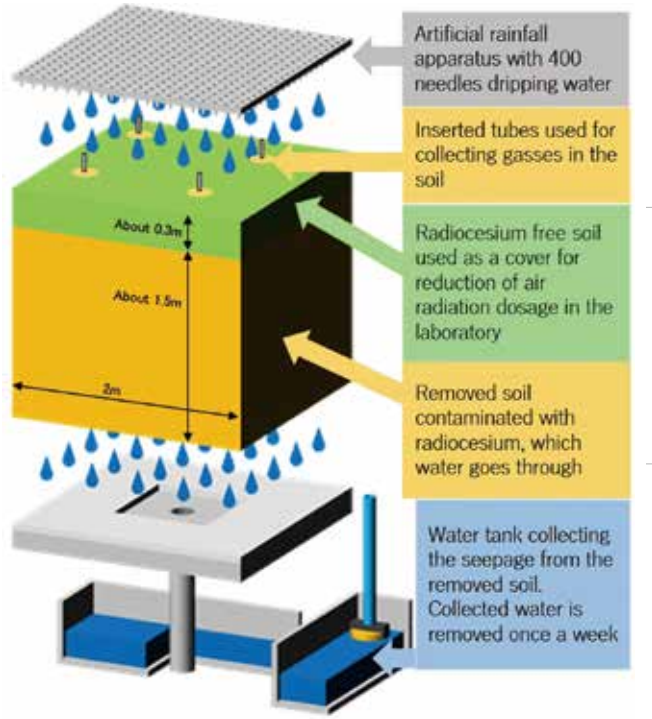

Figure 1: A Large-scale Monolith Lysimeter Simulating Conditions of Artificial Rainfall on the Removed Soil

References

(1) Interim Storage Facility webpage of the Ministry of the Environment, Government of Japan (in English) http://josen.env.go.jp/en/storage/

(2) Decontamination in the Fukushima Prefecture webpage (in English) http://www.pref.fukushima.lg.jp/site/portal-english/en02-03.html

(3) Verification study on volume reduction of radioactive contaminated waste and removed soil, interim storage and final disposal, Ishimori H., NIES News36 (2) (in Japanese)

(4) NIES Letter Fukushima February 2017, the National Institute for Environmental Studies (in Japanese)

NIES Fukushima Branch

Recent events

June

Jun. 19 We held a seminar, inviting Ms. Cécile Asanuma-Brice at CNRS (French National Research Center).

Ms. Cécile came to the disaster area soon after the Fukushima Nuclear Accident, and has since been studying the future of evacuated people and areas, using a sociological approach. She talked about the knowledge gained so far and future study efforts.

Jun. 26 Nine employees of Toso Real Estate Company toured our facility.

Jun. 29 Eight employees of Obayashi Corporation visited NIES Fukushima Branch.

July

International Symposium on Remediation of Radioactive Contamination in the Environment was held at the same time.

Jul. 4 Masanori Tamaoki, principal researcher, gave an invited lecture on the theme of "Studies on Radiation Effects from the Fukushima Nuclear Accident on Wild Organisms and Ecosystems" at the planned session of the Society for Remediation of Radioactive Contamination in Environment (SRRCE).

We are answering questions about effects of future climate change on agriculture in Fukushima.

Jul. 12 About 40 students of Fukushima Seikei High School visited NIES Fukushima Branch.

Jul. 18 Two members of the Institute of Advanced Policy Studies at Korean Nuclear Society visited NIES Fukushima Branch.

Jul. 19 We exchanged opinions to promote cooperation among government, industry and academia, attending the academic and research institutes networking meeting held in Koriyama city.

At the Science Cafe, we actually measured the amount of electricity consumption using a wattmeter!

Jul. 22 The second anniversary event of the Fukushima Prefectural Centre for Environmental Creation, "Komyutan Fukushima Summer Festival Special" was held. Various events such as facility tours that allow visitors to enter the research buildings and a round-table talk (Science Cafe) with visitors on the theme of electricity consumption at home were conducted.

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Edit / issue NIES Fukushima Branch
10-2 Fukasaku, Miharu, Tamura District, Fukushima, 963-7700, Japan
E-MAIL fukushima-po@nies.go.jp
Website http://www.nies.go.jp/fukushima/

Website

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