

Exhibition Report: “RITE Future Forest” at Expo 2025 Osaka Kansai, Japan

Office for Expo 2025 Osaka Kansai Members (as of April 2026)

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| Acting Deputy Director (Concurrent) | Naoki Kikuchi | Concurrent Staff | Naomi Kurahashi |
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| Staff | Maki Kasuga | | |

At the World Expo 2025 Osaka Kansai, the Research Institute of Innovative Technology for the Earth (RITE) exhibited the RITE Future Forest to demonstrate negative emission technologies featuring direct air capture (DAC) and to communicate these technologies to the public. This exhibit presented the value chain of CO₂ capture, utilization, and storage in the actual environment and provided easy-to-understand explanations to visitors, thereby enhancing their understanding. This article reports the summary and achievements of this exhibit.

1. Introduction: Significance of the Expo Exhibition

The World Expo 2025 Osaka Kansai was held under the theme “Designing Future Society for Our Lives” for 184 days from April 13 to October 13, 2025 as a world expo for showcasing state-of-the-art technologies and social systems aimed at achieving a sustainable society. The Expo was a large-scale international event with participants from 153 countries/regions and eight international organizations and received more than 25 million visitors.

RITE co-sponsored the Future Society Showcase *Green Expo* and exhibited the RITE Future Forest. Since its establishment in 1990, RITE has promoted the development of technologies for resolving climate change issues. This exhibit was an important opportunity for communicating its research achievements and deepening related dialogues.

To achieve carbon neutrality, it is essential to implement, in society, negative emission technologies to capture, remove, store, and utilize CO₂ present in the air, in addition to the emission reduction measures such as energy saving and the introduction of renewable en-

ergy and other non-fossil energies. In particular, negative emission technologies play an extremely important role in achieving carbon neutrality amid the remaining industrial processes and transportation sectors where emission reduction is difficult. On the other hand, the recognition of these technologies in society has been low, calling for the enhancement of understanding.

The RITE Future Forest demonstrated and exhibited CO₂ Capture, Utilization and Storage featuring DAC (DAC-CCUS), thereby sharing these state-of-the-art technologies to visitors in an easy-to-understand manner and enhanced their understanding.



Figure 1 RITE Future Forest (panoramic view)

2. Concept and exhibit structure of RITE Future Forest

2.1. Basic concept

The RITE Future Forest was constructed on the basis of the concept of reproducing the roles of carbon absorption and circulation played by natural forests through science and technology. Just as natural forests absorb CO₂ through photosynthesis and fix carbon, the DAC and CCUS technologies function as artificial forests to capture, utilize, and store CO₂ from the air.

Through such a comparison with nature, the exhibit was so designed as to facilitate an intuitive understanding of specialized technology.

2.2. Three pillars

The exhibit had the following three technological pillars. The first pillar is the demonstration test of the DAC system conducted by the RITE Chemical Research Group as part of the New Energy and Industrial Technology Development Organization (NEDO) Moonshot Research and Development Project. The DAC system was actually operated to show visitors how CO₂ was captured from the air. The DAC systems of Nagoya University and Kyushu University, also participating in the project, were presented to showcase the technologies of these institutions. A key feature of the exhibit was the live operation of full-scale systems, demonstrating that negative emission technologies are already approaching practical deployment.



Figure 2 DAC system

The second pillar was the introduction of the CCS technology, which RITE has researched for many years. CCS is a technology to capture CO₂ and safely store it in the deep underground strata. To enhance social acceptance, measures were implemented to facilitate the intuitive understanding by visitors of the mechanism and safety of storage through easy-to-understand technical explanations and hands-on exhibits.



Figure 3 CCS exhibit section

The third pillar was CO₂ mineralization technologies. Maeda Road presented various initiatives for the effective use of CO₂, including the technology to use CO₂ as an asphalt pavement material. This introduced the viewpoint of regarding CO₂ not as mere waste to be disposed of but as a useful resource.

2.3. Participation in the Virtual Expo

For those who found it difficult to visit the Expo site, RITE also participated in the Virtual Expo and publicized online the details of the RITE Future Forest and its technical information. This provided information widely to those unable to visit the Expo site, raising awareness among the larger public.

3. Use of CO₂ captured by DAC and social demonstration: a demonstration test staged in the Expo site

3.1. Overview of the demonstration

One of the major characteristics of the RITE Future Forest was the demonstration of the value chain of CO₂ capture, utilization, and storage by actually using the CO₂ captured by DAC on and off the Expo site. This was

not a mere exhibit, but a social demonstration to verify the technological linkage and operational feasibility of the technology in the real world.

3.2. Use on Expo site

The captured CO₂ was supplied to the adjoining methanation plant of Osaka Gas to produce synthetic methane (e-methane) through the reaction with hydrogen. The produced e-methane was used in the guest house kitchen and the heat supply system on the Expo site by functioning as a carbon-neutral energy source. This was the first practical demonstration test of methanation using DAC- CO₂ in Japan.

The CO₂ was also supplied to the adjoining plant of Air Water to produce dry ice, which was used for event staging and cooling purposes on the EXPO site.

3.3. Use off Expo site

A part of the CO₂ was transported off the Expo site to be used for various purposes. To Mitsubishi Gas Chemical, the CO₂ was transported for the demonstration test of underground CO₂ storage and as a material for methanol production. Methanol is a basic raw material for chemical production and plays an important role in the transition to a sustainable chemical industry.

The CO₂ was also used for promoting the growth of plants in the greenhouse tea farm of Fukujuen. This indicated the possibility of the effective use of DAC- CO₂ in the agricultural sector.

4. Exhibition space and visitor tour

4.1. Design concept of Guidance Hall

The Guidance Hall, which welcomed visitors first, was a wooden building of the cross laminated timber (CLT) panel-folded structure and embodied sustainable architectural technology. The building was evaluated for its innovative structural design and environmental friendliness and received internationally acclaimed awards (iF DESIGN AWARD 2026 and Wood Design

Award 2025). The architecture itself is a symbol of sustainability.



Figure 4 Guidance Hall

4.2. Guidance video

In the hall, visitors watched a video of about 12 minutes using the latest 3D imaging technology that dispensed with goggles. This guidance video depicted, in an easy-to-understand manner, the changes in carbon circulation on the earth after the Industrial Revolution, the progress of global warming, and the roles of negative emission technologies as a solution thereto so that visitors could gain a comprehensive understanding before starting the tour. The video helped visitors have a deeper experience on the subsequent tour.



Figure 5 Guidance video

4.3. Guided tour with attendant commentary

The tour was conducted seven times a day with 20

persons and took about 60 minutes per tour. An attendant provided commentary to enhance the understanding of visitors. After watching the video in the Guidance Hall, the tour walked visitors through the actual DAC system on the second floor, the CCS experience in the exhibition space on the first floor, and the introduction of the technologies for using CO₂. The structure helped visitors gradually deepen their understanding.

Many tours concluded with spontaneous applause, reflecting visitors' deeper understanding of the technologies.



Figure 6 Guided tour

5. Visitor data and evaluation

5.1. Visitors

The exhibit had 18,610 visitors. The demographics of the visitors ranged widely, including general consumers, students, businesspersons, and government officials. The exhibit was also visited by many VIPs, including ministerial-level officials from Japan and abroad, which provided an opportunity to present the technologies to policymakers.

5.2. Results of visitor questionnaire survey

The visitor questionnaire survey indicated that 96% were satisfied or very satisfied with the tour, and 96% considered that they had a deeper knowledge and understanding of CCUS.

5.3. Media coverage

The media coverage of the exhibit comprised 15 TV shows, 78 newspaper articles, and 27 magazine and web media articles (120 in total). Many related posts were made on social media. These led to the increased awareness of the negative emission technologies featuring DAC and of RITE.



Figure 7 Coverage in "IMPACTS: Climate Change the World," an NHK WORLD-JAPAN program

6. Expo Innovation Award and future prospects

6.1. Expo Innovation Award

The RITE Future Forest Group (RITE, Maeda Road, Nagoya University, and Kyushu University) received the Expo Innovation Award for Cross-Sectoral Enlightenment because the demonstration test of the state-of-the-art technologies and the enhancement of understanding and awareness among general visitors were highly evaluated. This award indicates that RITE's research achievements and awareness raising activities have been recognized in an international forum, providing a strong impetus for its future activities.



Figure 8 EXPO Innovation Award ceremony

6.2. Inheritance of legacy and future activities

After the Expo, the Guidance Hall is to be relocated to the RITE headquarters and is to be used as a place for sharing and inheriting the legacy of the exhibit at the Expo. A possibility will also be pursued to use the hall as a place for supporting RITE's education and development.



Figure 9 Relocated hall (a conceptual diagram)

7. Conclusion

This exhibit made important achievements in promoting social understanding of negative emission technologies. Initiatives toward the practical use of the technologies were widely communicated through a technical introduction to 18,610 visitors, achieving a high 96% satisfaction rate, and 120 media articles and posts.

Going forward, RITE will accelerate the dissemination and practical use of the negative emission technologies and other climate mitigation technologies by reducing DAC costs, the social implementation of CCS, and the expansion of carbon recycling. RITE will continue to promote the development and social implementation of technologies to resolve climate change issues and contribute to the achievement of a sustainable society.

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