

7th International Conference on Carbon Recycling 2025: Summary Document

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Ministry of Economy, Trade, and Industry, Agency for Natural Resources and Energy
New Energy and Industrial Technology Development Organization (NEDO)

Overview

On October 10, 2025, the 7th International Conference on Carbon Recycling 2025 was held at the Hilton Osaka, bringing together representatives from academia, industry, and government worldwide. The International Conference on Carbon Recycling is an international forum aimed at reaffirming the commitment of participating countries to the development and demonstration of carbon recycling technologies, which are recognized as key to achieving net-zero emissions, with a view to their future social implementation, and at strengthening cooperative relationships among countries.

This year's conference saw the participation of approximately 650 people from 20 countries, with around 250 attending in person and about 400 joining online. EXPO 2025 OSAKA, KANSAI, held from April 2025, showcased a wide range of carbon recycling technologies developed by Japanese companies. This year's conference was held in Osaka to coordinate with these initiatives at EXPO.

2024 was the highest temperature year in history since observations began, with global average temperatures about 1.55° C above pre-industrial levels. It is the first time to be above 1.5° C. The world is facing frequent natural disasters and extreme weather. It is essential for countries to accelerate their efforts toward achieving net-zero emissions.

However, realizing net-zero is by no means an easy goal. Sustainable decarbonization efforts should be taken, ensuring a stable energy supply and economic growth at the same time. Furthermore, in recent years, increasing geopolitical risks and new electricity demands driven by the spread of AI have added to the uncertainties surrounding energy policy. In this context, the importance of Green Transformation (GX)—achieving stable energy supply, economic growth, and decarbonization simultaneously, through various pathways taking into account each country's circumstances—has become even greater.

The International Conference on Carbon Recycling is held as part of "Tokyo GX Week," , discussing international cooperation across various fields to achieve GX.

Carbon recycling technology enables re-use of captured CO₂ in the form of materials and fuels through processes such as mineralization and artificial photosynthesis. It is an indispensable technology for

advancing GX, contributing to the decarbonization of hard-to-abate sectors including steel, chemicals, and cement, that are difficult to decarbonize through electrification and a shift to non-fossil sources.

In the International Energy Agency (IEA) report "Net Zero Roadmap: A Global Pathway to Keep the 1.5 ° C Goal in Reach" it is estimated that approximately 35% of CO₂ emissions reductions by 2050 will be achieved through the deployment of new technologies. Carbon recycling technologies are positioned as one of the key measures to achieve this target.

At this seventh conference, panel discussions were held on the following themes: [i] cooperation on carbon recycling to contribute to CO₂ reductions across industrial society, [ii] pathways of carbon recycling technologies towards 2030, and [iii] business models for forming the carbon recycling market. In addition, an exchange event between students and experts was also held with the aim of fostering the next generation of talent.

Panel Discussion

Through this conference, the following points were confirmed:

① Cooperation on Carbon Recycling to Contribute to CO₂ Reductions Across Industrial Society

At the G7 Summit held in Hiroshima in 2023, it was acknowledged that CCUS/carbon recycling technologies can be an important part of decarbonization solutions to reduce emissions from industrial sources that cannot be avoided by other means. The application of carbon recycling requires government efforts to create a favorable business environment, including financial support. Furthermore, as carbon recycling technologies become more widely adopted globally and CO₂ supply chains extend across borders, international coordination of regulations will be necessary.

In Session 1, discussions were held on potential future collaborations and the roles that countries and businesses should play towards establishing a carbon recycling market., using examples of international cooperation in this field. During the panel session, it was noted that while technological development is essential for reducing the costs of carbon recycling products, current uncertainties—such as rising energy prices and the expected increase in energy demand from AI and other sources—make investment decisions difficult for private companies. Therefore, government support for technological development during the transition period is crucial. It was also discussed that establishing systems to evaluate the environmental value of carbon recycling products is necessary to stimulate demand, and that proactive government procurement of environmentally valuable products can lead to the early creation of markets.

Additionally, the importance of international cooperation was emphasized, including joint research and development, infrastructure development, partnerships between companies, and the role of emerging economies as regional hubs. On the other hand, challenges such as high costs and securing stable demand remain, and particularly in emerging economies, international cooperation in technology, funding, and

expertise was highlighted as indispensable.

② Pathway of Carbon Recycling Technologies towards 2030

According to the IEA's "ETP Clean Energy Technology Guide," co-electrolysis of CO₂ and H₂O for the production of CO₂-derived synthetic fuels in the hydrocarbon fuel sector has reached Technology Readiness Level 6 (TRL6), indicating significant progress in fuel-related carbon recycling technologies. In addition to the fuel sector, the potential applications of carbon recycling technologies are expanding in the fields of minerals and chemicals. For example, technologies for producing calcium carbonate and environmentally friendly concrete or cement from CO₂ have the potential to contribute to decarbonization in the construction and manufacturing industries. In the chemical sector, research and development of polymers and chemical products using CO₂ as a feedstock are underway, and these products are expected to enhance sustainability in the chemical industry.

Against this backdrop, Session 2 focused on the development of carbon recycling technologies, introducing the current technological progress and maturity in this field, and discussing technical challenges and prospects for future societal implementation. During the panel session, the latest carbon-recycling technologies in each field were presented, including environmentally friendly concrete utilizing steel slag and carbonates (minerals), catalytic processes for producing various basic chemicals from CO₂ (chemicals), and SOEC methanation (fuels). These presentations demonstrated the steady progress toward the practical application of carbon recycling technologies.

Participants confirmed a shared understanding of the importance of scaling up for cost reduction and the necessity of efforts by both public and private sectors to achieve this, including stable and diversified procurement of raw materials and regulatory frameworks for handling large volumes of CO₂. Furthermore, it was pointed out that scaling up overseas projects will require securing engineering expertise and understanding the cost structures and market characteristics specific to each country and region.

③ Business models for forming the Carbon Recycling Market

To achieve commercial success in projects utilizing carbon recycling technologies, it is essential to ensure economic viability by scaling up production, reducing procurement costs for raw materials such as CO₂ and hydrogen, lowering initial and operational costs through supply chain optimization, and establishing financing mechanisms including carbon credits. Additionally, visualizing the environmental value of products manufactured using recovered CO₂—such as concrete, fuels, and chemicals—can facilitate appropriate price transfer, thereby supporting the formation of a sustainable market based on carbon recycling technologies and products and accelerating their full-scale societal implementation.

In Session 3, discussions centered on new business models for the carbon recycling sector, particularly from the perspectives of industry and market players, focusing on the measures needed to expand business activities. Advanced case studies that promote inter-industry collaboration to build value chains from CO₂ emitters to end users were examined to identify specific actions that should be taken by stakeholders such as governments, companies, and international organizations. The panel session featured examples of pioneering inter-industry cooperation both in Japan and overseas.

Through these discussions, the importance of visualizing and clarifying the requirements and interests of stakeholders—such as regulatory frameworks, cost tolerance, and the value of CO₂ emission reduction—on both the supply and demand sides of CO₂, as well as matching and facilitating communication between them, was highlighted as critical for building efficient CO₂ supply chains. The role of project management and governance was also emphasized. Furthermore, it was pointed out that establishing systems to visualize and allocate the value of CO₂ emission reduction is necessary to further promote inter-industry collaboration