



**CARBON  
RECYCLING  
FUND INSTITUTE**

**Paving the way for the Sustainable Carbon System**

# Carbon Recycling Fund Institute

Contribute to the creation of innovation by using CO<sub>2</sub> as a resource

## Background and Objectives for Establishment

Carbon is a basic substance that is essential for sustaining life. We believe that the essence of the global warming problem is that human beings have used fossil fuels at an excessively fast rate since the Industrial Revolution, which has led to an increase in CO<sub>2</sub> in the atmosphere beyond the natural balance.

In order to achieve carbon neutrality by 2050, we believe that the concept of carbon recycling (Sustainable carbon system) is necessary, and that it is essential to innovate in this way. We believe that by promoting carbon recycling, it will be possible to address not only global warming but also issues such as energy access, biodiversity, and plastics waste at the same time.

The Carbon Recycling Fund (CRF) (established in August 2019) is a cross-industry organization based in the private sector that conducts research grant activities and public relations activities and so on. Through these activities, we will create innovation in carbon recycling, embody social implementation for regional revitalization and contribute to the realization of carbon neutrality around the world through international collaboration.

## Overview

**Name:** Carbon Recycling Fund Institute

**Established:** August 30, 2019

**Address:** 3F Daiichi Misu Building, 2-34-7, Nishi-Shimbashi, Minato-ku, Tokyo 105-0003

**Membership categories (annual membership fee):**

Corporate members: 200,000 yen/

Individual members: 10,000 yen/

Local government members (-)/ Academic members (-)

**Membership list**

Please refer to the attachment or our website for the latest list.

**Chairperson:** Tsugio MITSUOKA (Chairman of the Board, IHI Corporation)

**Vice Chairperson:** Masayoshi KITAMURA (Counselor, Electric Power Development Co., Ltd.)

**Vice Chairperson:** Noriyuki MITA (Vice President, Chief Sustainability Officer, Mitsubishi Chemical Group Corporation)

**Senior Executive Director:** Masamichi HASHIGUCHI

**Director:** Atsushi HIRANO (Representative Director and Vice President, Idemitsu Kosan Co., Ltd.)

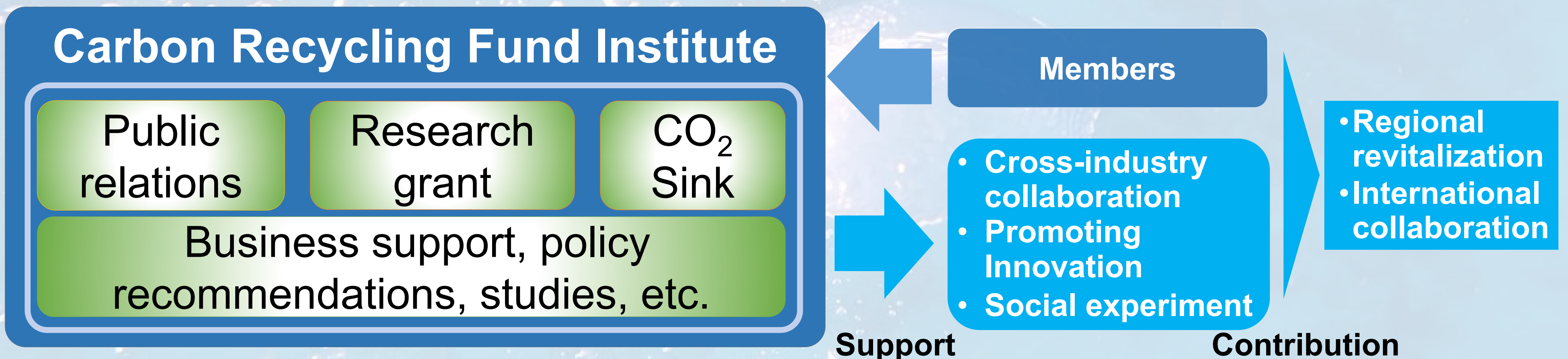
**Auditor:** Kouji TAKEDA (Managing Executive Officer, IHI Corporation, Head of Resources, Energy, and Environment Business Area)

**Executive Adviser:** Yoshimitsu KOBAYASHI (Chairman of the Board, Tokyo Electric Power Company Holdings, Inc.)

**Adviser:** Takeo KIKKAWA (President, International University of Japan (IUJ))

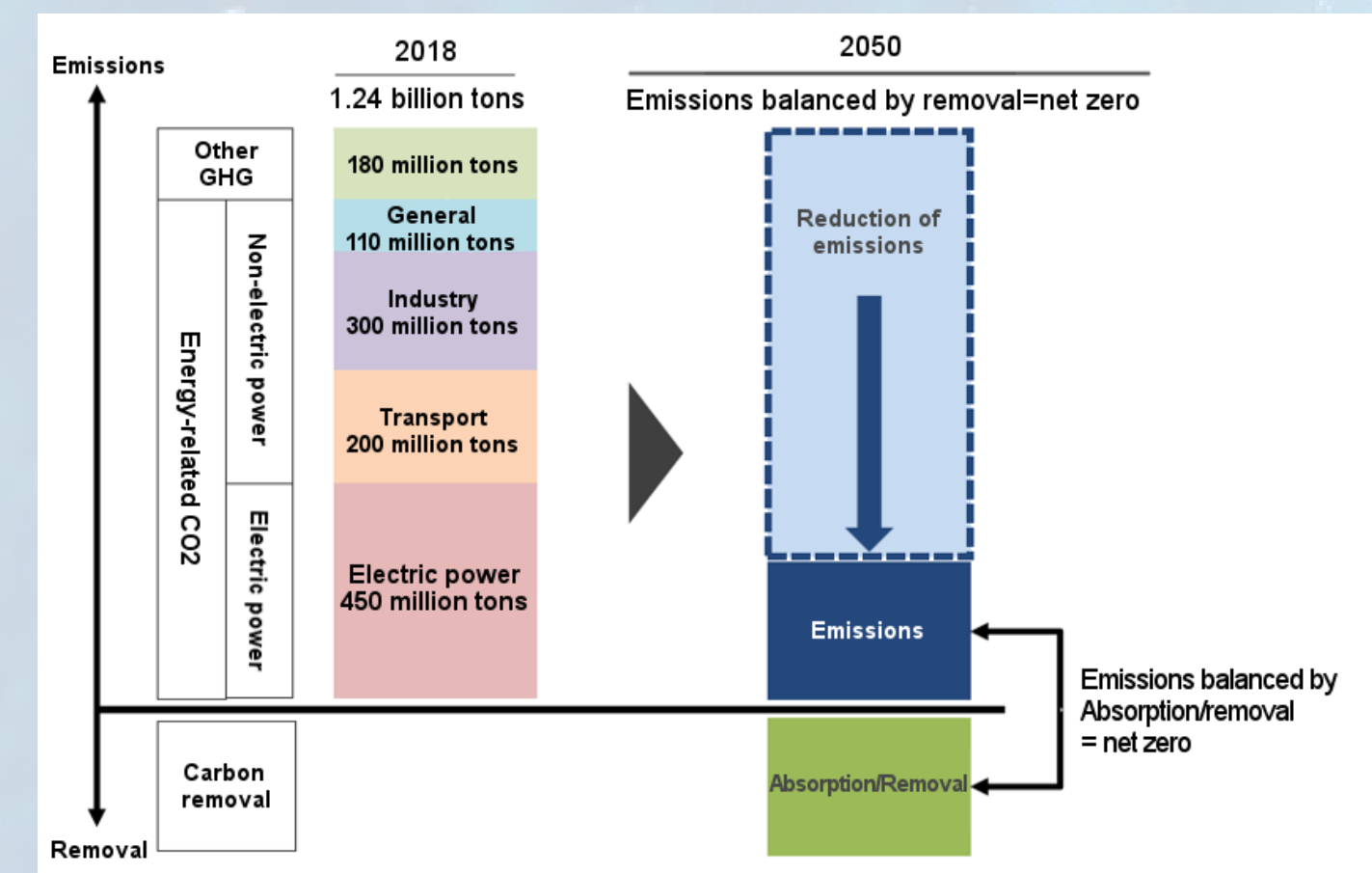
## Activities

### Membership fee, Donations



## Towards achieving a sustainable carbon system

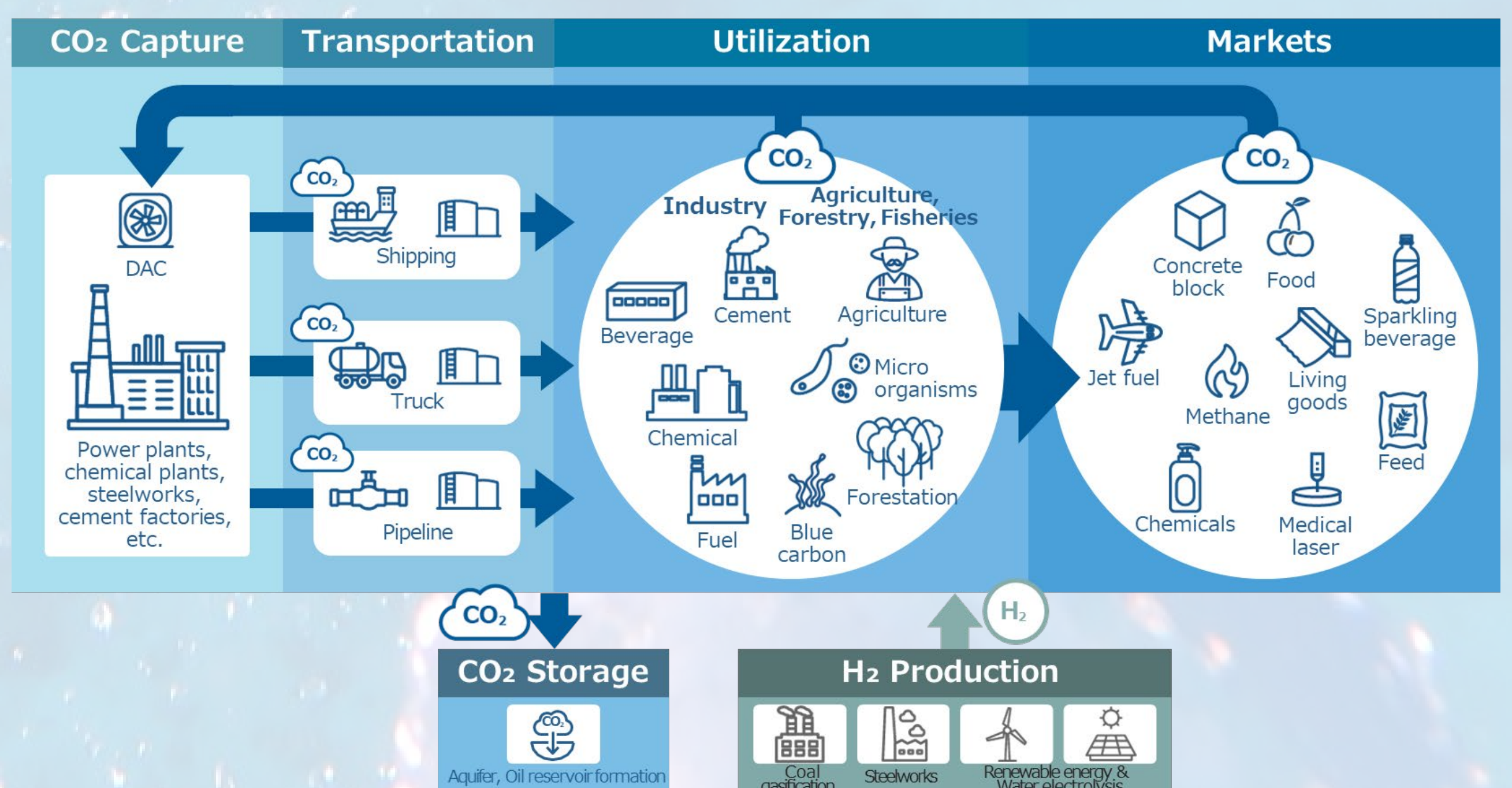
- It is important to **balance the amount of CO<sub>2</sub> emission with the amount of absorption and removal (usage and fixation).**
- Not only emission reduction, but **CCUS/ carbon recycling and absorption into forests, oceans, and soils** are key.
- It is important to **build a value chain for CO<sub>2</sub>**, from the sources to the collection, transport, use and storage of CO<sub>2</sub>.



The society we should aim for to achieve carbon neutrality

Sustainable carbon system

Aiming for a global carbon cycle using the power of the earth and living organisms



# Activities

## I. Public relations

The institute provides the latest information on carbon recycling in Japan and elsewhere through a variety of media including our website, participates in international exhibitions, holds events, symposiums, and training sessions in collaboration with various media, and conducts other public relations activities, such as awareness-raising activities related to carbon recycling.

### Carbon recycling closed community



The institute holds online lectures on timely topics to share information and discuss carbon recycling/carbon neutrality among its members.

This program is for CRF members only.

### University of Carbon Recycling



Carbon Recycling University is an education program which fosters problem-solving thinkers.

- Each year, twenty employees from member companies participate in the program.
- Collaboration with startup companies
- Presentation of discussion results and cross-industrial exchanges

### Sharing information on websites etc.

Examples of carbon recycling and carbon neutral initiatives by CRF members posted on the website. (in Japanese)

### The tale of Carbo and Risa

The tale of Carbo and Risa is an original digital content of the institute which conveys the significance and initiatives on carbon recycling to the next generation in a fun way.

### Participation to exhibitions, symposiums etc.

The top management of the institute disseminates the significance of sustainable carbon to the world and participates in exhibitions to promote CR activities.



Chairperson Nobuo FUKUDA (2023) during a speech at the UN STI Forum



Chairperson Tsugio Mitsuoka during a speech at 5<sup>th</sup> international Conference on Carbon Recycling 2023

## II. Research grants

A number of obstacles are blocking the practical viability of carbon recycling, including issues of cost, international competition, funding for fundamental research and others. The institute offers grants and member matchings to researchers and startups who are taking on these challenges to create innovation. We also promote working group activities for the purpose of social experimentation of various initiatives.

	Outline
Grant recipients	Grants are given to a researcher or a team of researchers belonging to a company, university, or corporation. A new startup support quota was established in FY2022.
Assessment points	Originality, innovation, superiority over conventional technologies, how to define issues, social feasibility such as collaboration with companies, etc.
Grant amount	Ten million yen/ case (average grant amount: approx. 7 million yen/ case)
Application/ approved cases	Total (FY2020~FY2024) : 356 applications → 71 accepted (including adoption for startup support)



Presentation on the research grant activities (as membership benefit)

## III. CO<sub>2</sub> Sink

We have engaged in considering the development of rules for CO<sub>2</sub> sinks and activities to spread understanding of CO<sub>2</sub> sinks by planting fast-growing trees with local communities and members.

### CO<sub>2</sub> sink study group

### Activities to spread understanding of CO<sub>2</sub> sink



Tree Planting with our members and local companies

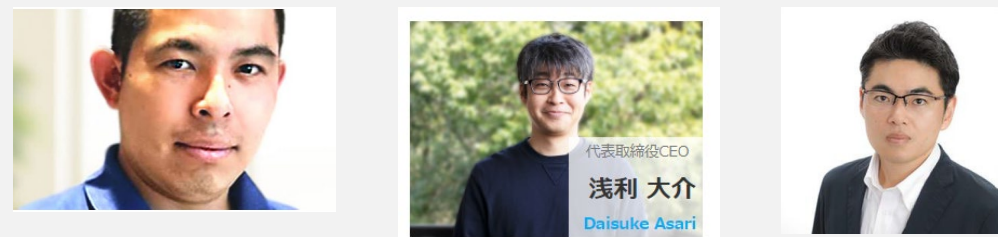
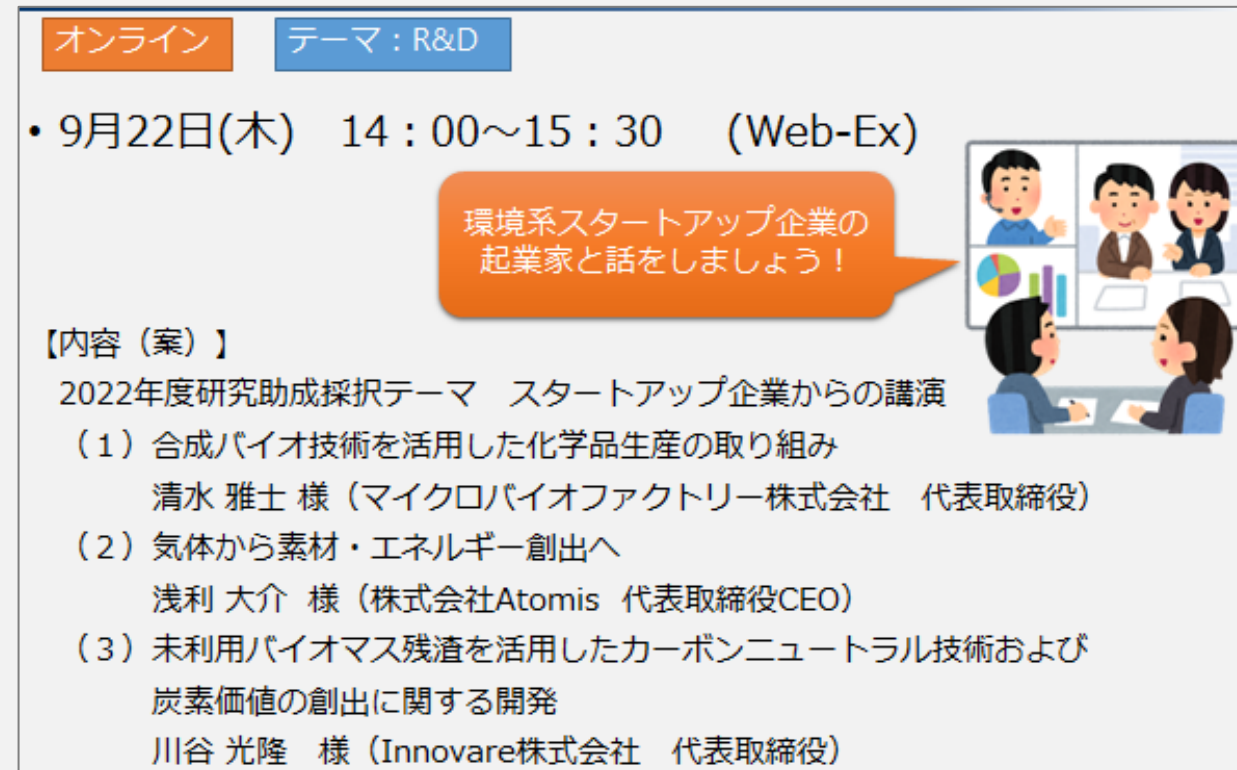
## IV. Business support, policy recommendations, information analysis, etc.

The institute provides business support and offers recommendations on national policies on energy, environment and technology development policies for the social implementation and commercialization of carbon recycling. We also collect the latest news from around the world about carbon recycling and CCUS and distribute dozens of articles each week to our members.

- Embodiment of social implementation of carbon recycling (social implementation working group)
  - ✓ Implement activities to link the carbon recycling value chain through social implementation working group.
  - ✓ Explore how carbon recycling can contribute to the revitalization of local industries by leveraging regional strengths.

## Carbon recycling closed community

- The Institute is continuing to grow into a group that collaborates with various industries through our activities.
- Over 100 people participate and interact each time.



### Speakers in Carbon Recycling closed community

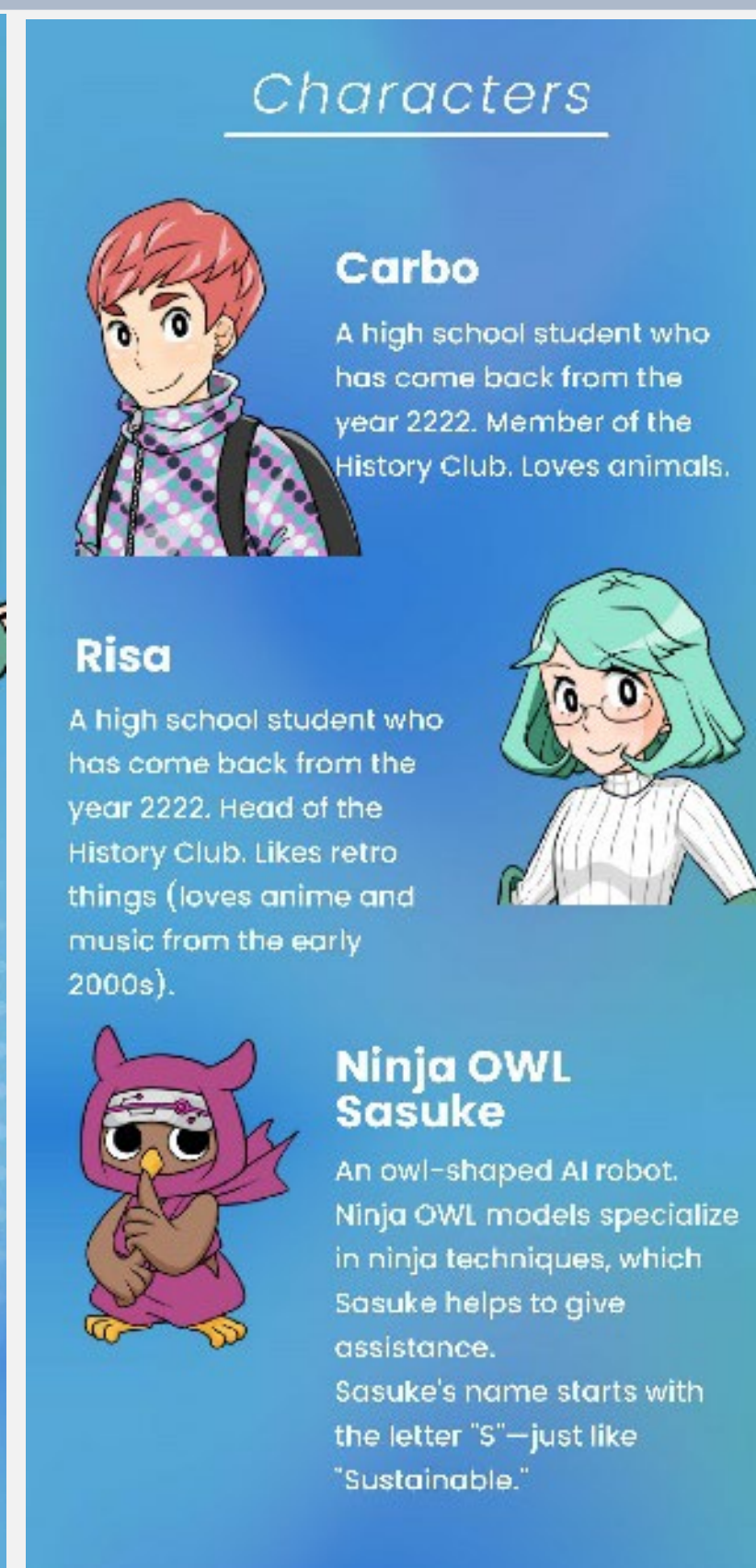
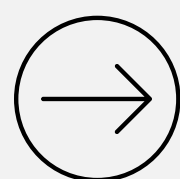
(Speaker: Leading experts in a particular field, Researcher, Start-up Company, Our members)

## The tales of Carbo and Risa

High schoolers from the future, Carbo and Risa, time travel back to the 2020s to study about carbon recycling.

With an eye on future generations, you can enjoy learning with this content the importance of carbon recycling and initiatives for it. It's fun to learn about and easy to understand.

Scan here



## Message from leaders

CRF leaders introduce endeavors of the Institute and its members at international conferences, exhibitions, etc.

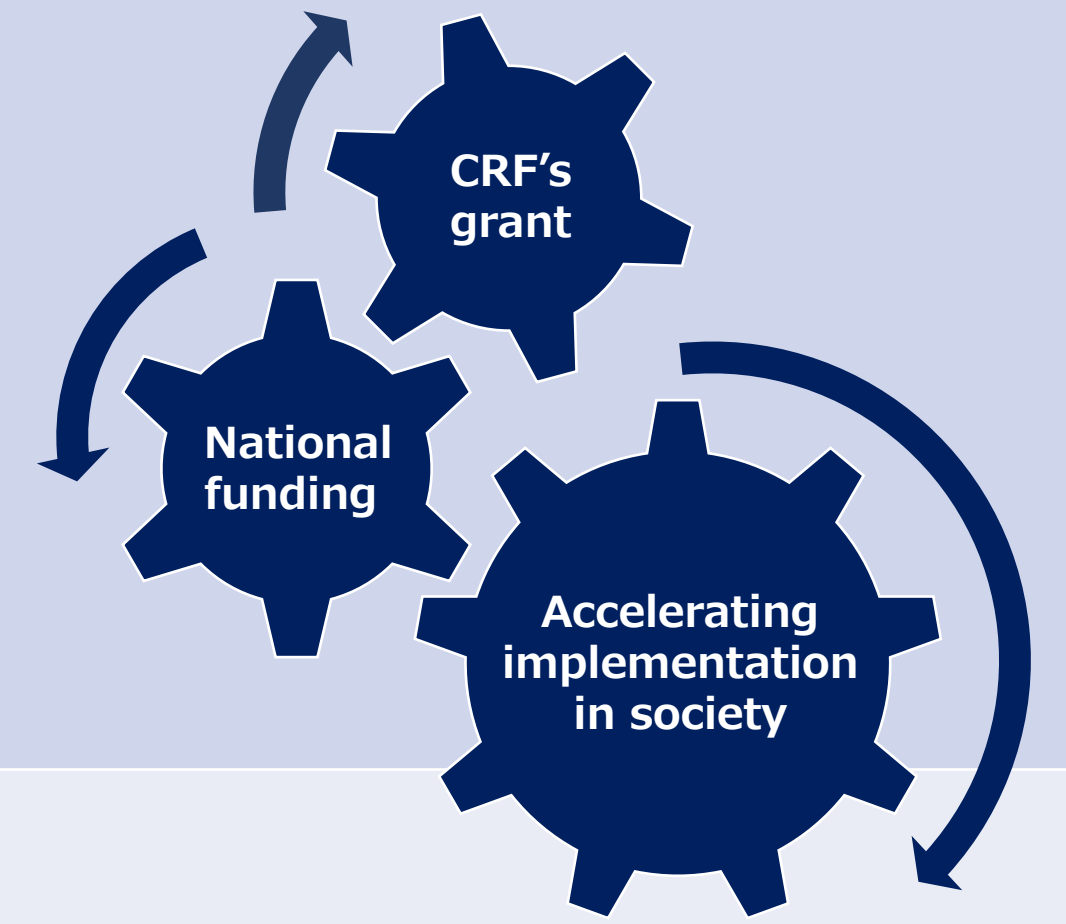


Chairperson Tsugio Mitsuoka during a speech at 5<sup>th</sup> international Conference on Carbon Recycling 2023



Vice Chairperson Masayoshi Kitamura during a speech at the Smart Energy Week 2023

	Features
<b>Eligibility</b>	Researchers or teams affiliated with companies, universities, etc. A startup support framework newly established in FY2022
<b>Research targets</b>	<p>Research on carbon recycling that uses CO<sub>2</sub> (or carbon atoms) as a resource, related technologies, and social science to solve social issues</p> <p>&lt;Expected Fields&gt;</p> <ol style="list-style-type: none"> <li>1. CO<sub>2</sub> fixation by mineralization (materials such as concrete)</li> <li>2. Conversion to fuels</li> <li>3. Conversion to chemicals</li> <li>4. Separation and recovery (including direct-air capture)</li> <li>5. Social science</li> <li>6. Utilization of CO<sub>2</sub> sinks (soil, forests, blue carbon, biologics, agriculture, forestry and fisheries)</li> <li>7. Other (H<sub>2</sub> production, geo-engineering, functional materials, medical fields, etc.)</li> </ol>
<b>Evaluation points</b>	Creativity, innovativeness, superiority over conventional technologies, method to determine issues, and social realization potential through collaboration with companies
<b>Grant scale</b>	Approx. 10 million yen per case (average: approx. 7 million yen per case)
<b>Number of applications and accepted cases</b>	<p>FY2020~FY2022 : (total) 165 applications → 40 accepted</p> <p>FY2023: 56 applications → 15 accepted and 31 applications for startup support → 2 accepted</p> <p>FY2024: 78 applications → 13 accepted and 26 applications for startup support → 1 accepted</p>
<b>Attribution of research results</b>	Research results basically belong to researchers



## Projects selected as government-funded projects or joint research with companies

Research field	Grantee	Research project name (grant fiscal year)	Principal investigator name (affiliated institution)
Technologies for CO <sub>2</sub> fixation	Joint research with companies (verification testing)	Development of a novel CO <sub>2</sub> immobilization technology using microbial fuel cells (FY 2022)	Daisuke SANO (Tohoku University)
	NEDO and MOE	Development of a novel CO <sub>2</sub> mineralization method using for waste seawater using biogenic amines (FY 2021)	Ko YASUMOTO (Kitasato University)
Technologies for conversion to fuels	JST/OPERA	Breeding to eliminate bottlenecks against practical application of microseaweed-derived biofuel (FY 2021)	Shigeaki HARAYAMA (Chuo University)
Technologies for conversion to chemicals	Green Innovation Fund	Development of super-efficient polyurethane material production method using CO <sub>2</sub> (FY 2021)	Katsuhiko TAKEUCHI (National Institute of Advanced Industrial Science and Technology)
	Joint research with companies, etc.	Development of technology for synthesizing lactic acid and polylactic acid from carbon dioxide (FY 2021)	Hajime KAWANAMI (National Institute of Advanced Industrial Science and Technology)
	Joint research with companies	Adaptive research on new low-temperature methanol synthesis catalyst to IGCC+CCS (FY 2020)	Noritatsu TSUBAKI (University of Toyama)
Technologies related to CO <sub>2</sub> separation and capture	JST/JST-Mirai	Development of CO <sub>2</sub> absorber for low-cost CO <sub>2</sub> -free hydrogen production (FY 2021)	Kei INUMARU (Hiroshima University)
	Joint research with companies, etc.	Development of highly efficient DAC technology using CO <sub>2</sub> absorbing and releasing agents that separate even water (FY 2021)	Fuyuhiko INAGAKI (Kobe Gakuin University)
Social sciences	MOE	Research on the Realization of Setouchi Carbon Recycling Complex (FY 2020)	Takayuki ICHIKAWA (Hiroshima University)
	ERCA (Environment Research and Technology Development Fund)	Regime Change for Carbon-Neutral Agriculture, Forestry, and Fisheries (FY 2023)	Ayu WASHIZU (Waseda University)
Circulation of carbon resources	Launching a startup	Highly-Efficient Conversion of CO <sub>2</sub> Utilizing Biomass, Brown Coal and Metal Ion Media (FY 2020)	Ryuichi ASHIDA (Kyoto University)
Utilization of CO <sub>2</sub> sinks	JST/A-STEP (tryout) Launching a startup	Development of a compact horticultural system with atmospheric CO <sub>2</sub> enrichment by membrane separation (FY 2021)	Shigenori FUJIKAWA (Kyushu University)
	JSPS (grants-in-aid for scientific research)	Enhancement of plant CO <sub>2</sub> uptake using a chemical compound (FY 2022)	Yohei TAKAHASHI (Nagoya University)



Field	Study title	Name of Research Representative (Organization)
CO <sub>2</sub> separation and capture	Development of DAC system with high CO <sub>2</sub> concentration by zeolite-based pressure swing	Kenta IYOKI (Planet Savers Inc.)
	Investigation of Ion-gel Membranes for Direct Air Capture	Yu KANASAKI (National Institute of Advanced Industrial Science and Technology)
CO <sub>2</sub> storage	R&D on CO <sub>2</sub> fixation technology into the goaf of a closed coal mine	Shohei TAKEUCHI (Mikasa City, Hokkaido)
Conversion to fuels or chemicals	Methanol production by electrolytic CO <sub>2</sub> reduction using 1 nanometer copper cluster	Tokuhisa KAWAWAKI (Tokyo University of Science)
	Closing the carbon cycle by using ammonia energy to produce olefins from CO <sub>2</sub>	Martin KELLER (National Institute of Advanced Industrial Science and Technology)
	Development of a Chemical Reactor to Produce Synthetic Hydrocarbon Fuels from CO <sub>2</sub> Using an Internal Combustion Engine	Tadanori YANAI (Shizuoka Institute of Science and Technology)
Social sciences	Lifestyle measures to promote lower carbon emission and higher birth rate	Hidenori KOMATSU (Central Research Institute of Electric Power Industry)
Circulation of carbon resources	Resource Recovery of Waste Plastics through Photoreforming	Haruki NAGAKAWA (Ibaraki University)
	[Startup support framework] Catalytic plastic depolymerization and organic waste decomposition into hydrogen	Tadashi KUBO (AC Biode)
Utilization of CO <sub>2</sub> sinks	Sugar production on both land and sea by sugar corn, sugar sorghum and sugar eelgrass	Ryushiro KASAHARA (Nagoya University)
	Elucidating the mechanisms and quantifying carbon capture in next generation seaweed farms	Gregory N. NISHIHARA (Nagasaki University)
	Cultivation of biofuel plants for revegetation of abandoned coal mine sites	Shin OKAZAKI (Tokyo University of Agriculture and Technology)
	Development of a forest DX management system that contributes to judgment criteria for logging and planting that can realize a sustainable carbon cycle	Tohru NAKAJIMA (The University of Tokyo)
Conversion to high value-added materials	Development of A Next-Generation Horticulture System Utilizing Atmospheric CO <sub>2</sub>	Naomi TANGA (ARCS LLC.)



### ●CO<sub>2</sub> sink study group

【Object】 Sharing the prospects and challenges of the current CO<sub>2</sub> sink business with members

【Action】 In 2023, CO<sub>2</sub> sink study group performed lectures and a panel discussion had held three times. <Theme> Part 1 Green Carbon, Part 2 Blue Carbon, Part 3 Biochar

### ●Activities to spread understanding of CO<sub>2</sub> sinks

【Object】 Through event holding, understanding CO<sub>2</sub> sinks

【Action】 Planting fast-growing trees with local communities and members



Part 2 of CO<sub>2</sub> sink study group ( Dec. 2023)

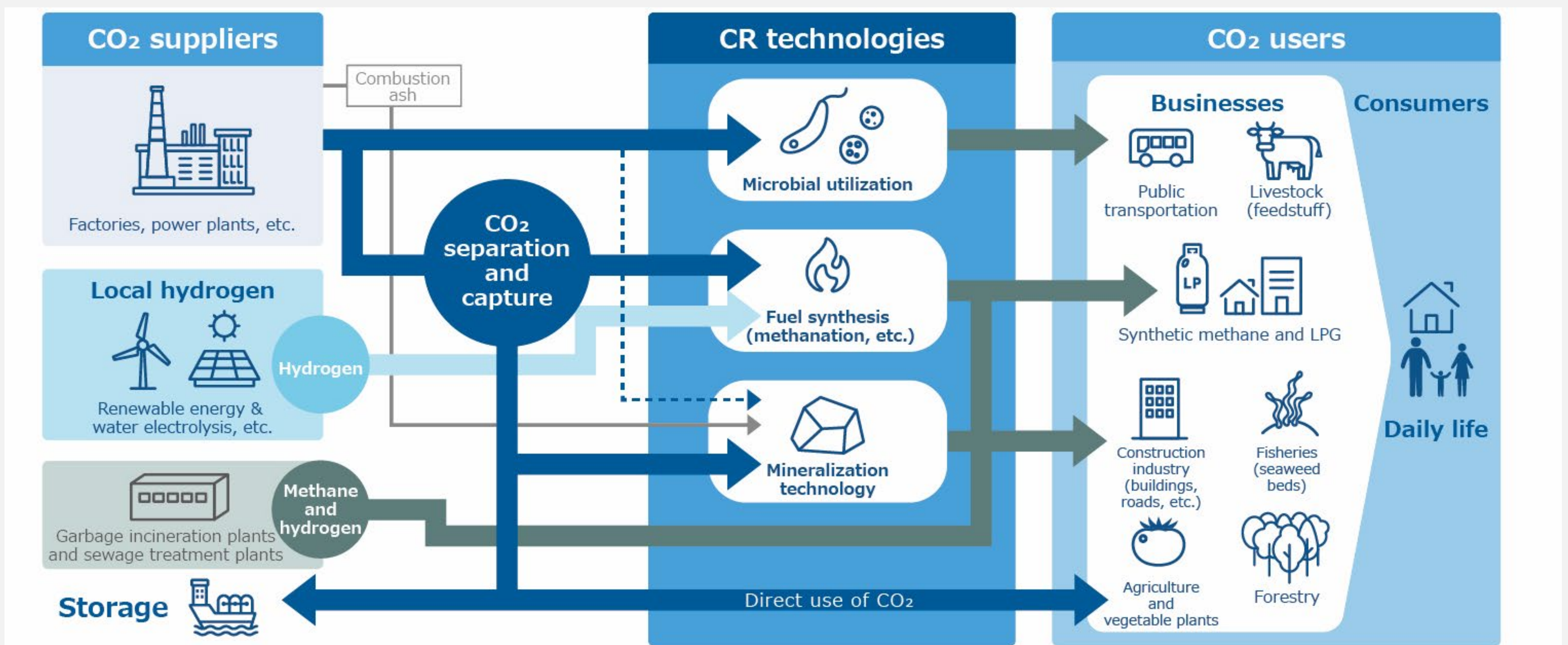


Planting fast-growing trees at City of higashimatsuyama (Left: tree planting in 2023, Right: after 1 year in 2024)



### Working Group for Social Implementation

- We studied how to connect CO<sub>2</sub> value chains in a locality  
FY2022 in Takehara (Hiroshima)  
FY2023 in Omuta (Fukuoka) and Sakata\* (Yamagata) \*ongoing
- Participants including CRF members, local government, and research institutes examined how carbon recycling can contribute to local rejuvenation together with local companies





# CARBON RECYCLING FUND INSTITUTE

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