

## Research & Coordination Group

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## Toward Creating Innovation for a Lasting Friendship between People and the Earth

### 1. Introduction

The year 2025 was marked by record-breaking heat, with the number of days exceeding 40°C reaching a historic high of nine. The surge in rice prices has also been attributed in part to the extreme heat, making it a year in which climate change became impossible to ignore.

Against this backdrop, expectations for the climate change mitigation technologies pursued by our institute and demands for their practical implementation have continued to grow steadily.

The relationship between human activity and the earth can be likened to human relationships: if either side is overburdened, the relationship cannot be sustained. We believe that research and development can help expand the foundation for a lasting friendship between people and the earth, and RITE is playing a part in this effort (Figure 1).

In short, while keeping in mind the current trend toward carbon neutrality, RITE is conducting R&D related to climate change and ensuring that people and the earth can form friendship for many years to come.

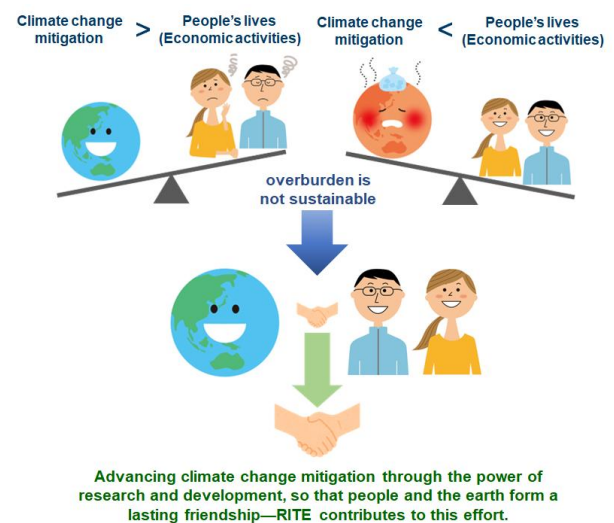


Figure 1 Enabling a lasting friendship between People and the Earth through Research and Development (Conceptual Illustration)

Based on this understanding, the Research & Coordination Group has four major functions: 1) explore new R&D topics while looking at domestic and overseas policies and technology trends and propose and implement new research themes by taking advantage of the research potential of RITE; 2) support the government with regard to the Intergovernmental Panel on Climate

Change (IPCC) and facilitate collaboration with international organizations, such as the International Organization for Standardization (ISO); 3) promote the dissemination of RITE's technologies and develop human resources for the future; and 4) promote the practical application of technologies through collaboration with the industry. We, together with research groups, have been actively working on policy support, technology development, and the creation of innovation in order to pursue both global environment protection and economic development.<sup>1)</sup>

In addition, by taking advantage of Expo 2025 Osaka, Kansai, Japan, held from April to October last year, RITE exhibited the RITE Future Forest, which introduced negative emission technologies. The exhibition attracted nearly 20,000 visitors and was very well received.

Here, we would like to first provide an overview of the Japanese government's actions taken toward carbon neutrality in fiscal year 2025 and then touch on the specific R&D being carried out by this group.

### 1.1. Trends surrounding Japan's climate change mitigation efforts in FY2025

Fiscal year 2025 can be regarded as a year in which Japan's efforts toward climate change mitigation gained significant momentum, both in terms of institutional frameworks and concrete projects, despite developments such as the United States' withdrawal from the Paris Agreement and increasing global tensions.

Specifically, in May, the amended GX Promotion Act was enacted, clarifying the schedule for developing institutional frameworks toward Green Transformation (GX). In addition, in the field of carbon capture and storage (CCS), progress was made both in regulatory systems and project support following the development of CCS-related legislation. Concrete steps toward commercialization were also taken, including the granting of an exploratory drilling permit in Tomakomai and the

designation of a specified area in Kujukuri.

Looking at global developments, at COP30 held in November, a policy package known as the Global Mutirão Decision was adopted. Furthermore, within the IPCC, a new phase, the Seventh Assessment Report (AR7), has commenced.

In this section, we will outline COP30 and the amended GX Promotion Act. The full-scale implementation of the CCS Business Act and IPCC-related developments will be discussed in detail in Section 2 and beyond.

### 1.2. COP30

COP30 was held in Belém, Brazil, in November last year. A comprehensive "cover decision" encompassing a wide range of areas such as mitigation and climate finance was adopted, known as the "Global Mutirão Decision" (mutirão meaning "collective efforts" in Portuguese). Its main points are as follows:

○ Mitigation (reduction of greenhouse gas emissions):

Acceleration of mitigation efforts toward achieving the 1.5°C target, raising ambition levels, and calling on countries that have not yet submitted their Nationally Determined Contributions (NDCs) to do so promptly.

○ Climate finance:

Under the New Collective Quantified Goal (NCQG) agreed at COP29, a target to triple adaptation finance was set as an aspirational goal, and a two-year work program was launched.

○ Unilateral trade-restrictive measures related to climate change:

A dialogue is to be held with the participation of Parties and relevant organizations such as the World Trade Organization (WTO).

○ Regarding the Global Goal on Adaptation (GGA), which focuses avoiding and reducing climate impacts, a list of indicators was adopted, although further consideration will continue.

### 1.3. Amended GX Promotion Act

The amended GX Promotion Act is a law designed to facilitate a smooth transition to a decarbonized, growth-oriented economic structure. It was enacted in May 2025 and came into force in April 2026. The main measures included in the Act are as follows:

#### ○ Mandatory emissions trading system (GX-ETS)

Starting in April 2026, large-scale emitters producing 100,000 tons or more of CO<sub>2</sub> annually are required to participate in the emissions trading system. This enables the trading of emission allowances among companies and strengthens incentives for reducing emissions.

#### ○ Introduction of a fossil fuel levy

From fiscal year 2028, a levy will be imposed based on the consumption of fossil fuels such as oil, coal, and natural gas, establishing a mechanism for sharing the cost of CO<sub>2</sub> emissions across society as a whole.

#### ○ Mandatory use of recycled resources

For certain products, including plastics and metals, the use of recycled materials is mandated, thereby promoting more efficient resource use and advancing a circular economy.

In parallel with these developments, institutional design efforts are accelerating. For example, under the Emissions Trading Subcommittee of the Industrial Structure Council of the Ministry of Economy, Trade and Industry (METI), working groups such as the Manufacturing Industry Benchmark Working Group and the Power Generation Benchmark Working Group have been established.

## 2. Research and survey activities

### 2.1. Introduction

Achieving Green Transformation (GX) in sectors that are difficult to decarbonize will be a key challenge on the path toward carbon neutrality by 2050. In these sectors, the introduction of Carbon dioxide Capture and

Storage (CCS)—which captures CO<sub>2</sub> after the use of fossil fuels and raw materials and stores it underground—is essential as a means of advancing decarbonization.

To this end, it has been decided to establish a business environment that will enable private companies to launch CCS projects by 2030 (GX Promotion Strategy, approved by the Cabinet in July 2023), and the CCS Business Act<sup>2)</sup> has been promulgated. In addition, discussions on the framework for government support have started in the Carbon Management Subcommittee<sup>3)</sup> (hereinafter referred to as the “CM Subcommittee”) of the Advisory Committee for Natural Resources and Energy. This section presents an overview of Japan’s CCS initiatives to date, along with the results of surveys and research conducted by our group regarding support measures for CCS projects in Japan.

### 2.2. CCS initiatives in Japan

To date, efforts in Japan have progressed to a stage where scheme design for implementing CCS both domestically and internationally, as well as the consideration of business models across the entire CCS value chain (CO<sub>2</sub> capture, transportation, and storage), can be initiated. This progress has been supported by activities such as confirming a storage potential of approximately 16 billion tons through surveys of suitable storage sites, as well as the development and demonstration of technologies across the CCS value chain. Looking ahead, in alignment with investment decisions expected from CCS operators around 2026, discussions are underway on the design of support systems that will enable smooth market entry and operation by CCS project developers, with the aim of launching CCS projects in the early 2030s.

#### (1) CCS Business Act <sup>2)</sup>

The CCS Business Act was promulgated in May 2024. On August 5, a permit system for exploration was introduced, including provisions on exploration methods

and application procedures. Subsequently, on November 18, 2024, systems related to exploratory drilling came into force, including the designation of specified areas (for exploratory drilling), the introduction of a permit system for exploratory drilling, and an approval system for exploratory drilling plans. Furthermore, by May 2026, additional systems are scheduled to be implemented, including the designation of specified areas (for storage projects), a permit system for storage projects, an approval system for storage project plans, the transfer of relevant functions to JOGMEC, and a notification system for pipeline transportation projects.

In February 2025, offshore area of Tomakomai city

was designated as the first specified area.<sup>4)</sup> Following a public call for operators, consultations with the prefectural governor, a public inspection process, and other steps, exploratory drilling permission was granted to Japan Petroleum Exploration Co., Ltd. on September 17 of the same year.<sup>5)</sup> A exploratory drilling survey commenced on November 4, and a second exploratory drilling is scheduled for July 2026.

In addition, offshore area of Kujukuri in Chiba Prefecture was designated on September 17, 2025 as the second specified area<sup>6)</sup>, and exploratory drilling permission was granted to Metropolitan CCS Co., Ltd. on April 17, 2025.<sup>7)</sup>

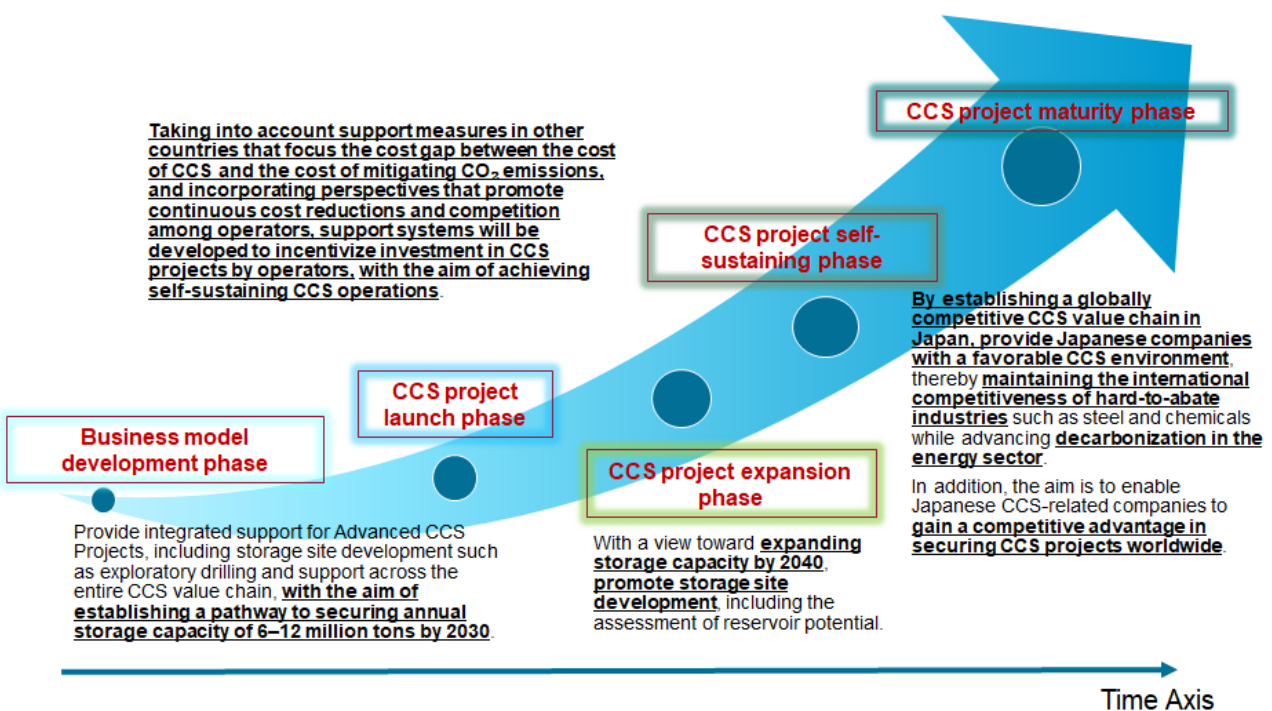


Figure 2 Conceptual Roadmap for the Promotion of CCS

Source: Reference materials from the 8th Carbon Management Subcommittee meeting (December 18, 2024)—Conceptual illustration of future CCS project promotion

[https://www.meti.go.jp/shingikai/enecho/shigen\\_nenryo/carbon\\_management/pdf/008\\_03\\_00.pdf](https://www.meti.go.jp/shingikai/enecho/shigen_nenryo/carbon_management/pdf/008_03_00.pdf) (in Japanese)

## (2) Support for CCS commercialization<sup>8)</sup>

According to the CCS Long-Term Roadmap<sup>9)</sup>, integrated support will be provided for Advanced CCS Projects, including storage site development such as exploratory drilling and support across the entire CCS value chain, with the aim of establishing a pathway to securing annual storage capacity of 6–12 million tons by 2030. The Seventh Strategic Energy Plan<sup>10)</sup> (approved by the Cabinet in February 2025) states that, taking into account support measures in other countries, support scheme will be considered to incentivize investment in CCS projects by CCS operators. These measures will also incorporate perspectives that promote continuous cost reductions and competition among operators.

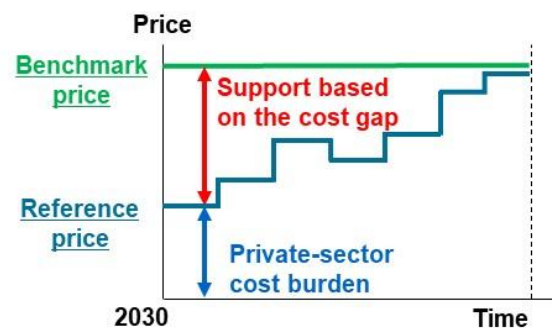
Discussions began at the 5th meeting of the CM Subcommittee in September 2024, and a draft framework was presented in December. Subsequently, detailed institutional design has been discussed within a Working Group (WG) on support measures for CCS projects, established in February of the following year.

In July 2025, as discussions on support measures for pipeline-based CCS projects progressed, an interim summary was compiled. An interim summary for ship-based transportation projects is also expected to be prepared, after which both will be consolidated into a final report.

The interim summary identifies a key condition for achieving self-sustaining CCS projects, that CCS costs must be lower than the cost borne by emitters for CO<sub>2</sub> mitigation. As CCS costs decline due to technological and market maturation as well as economies of scale, they are expected to eventually fall below CO<sub>2</sub> mitigation costs, so enabling self-sustaining operation. Specifically, focus on this cost gap, it has been proposed that the benchmark price be defined as the sum (per CO<sub>2</sub> ton) of (1) CO<sub>2</sub> capture costs (including CAPEX and OPEX for capture) and (2) transportation and storage fees (including CAPEX and OPEX for transportation and

storage), while the reference price is set as the carbon price. Support measures focusing on the gap between the benchmark price and the reference price would then be provided, in proportion to the volume of CO<sub>2</sub>, over a specified support period. Further consideration will proceed in this direction.

$$\text{Cost gap} = \text{Benchmark price} - \text{Reference price}$$



[Benchmark price]

The price calculated as the sum of the CO<sub>2</sub> capture cost, which is assessed for appropriateness based on domestic and international technology trends, and the transport and storage fee determined through an auction

[Reference price]

The carbon price used in the previous fiscal year under carbon pricing-related schemes, referenced on an annual basis

Figure 3 Conceptual Illustration of Support Based on the Cost Gap

Source: Working Group on Support Measures for CCS Projects, Carbon Management Subcommittee, Natural Resources and Fuel Committee, Advisory Committee for Natural Resources and Energy (5th meeting, Material 4, p.2)

## 2.3. Survey on the carbon footprint of CCS

Clarifying the value of CO<sub>2</sub> emission reductions achieved through CCS is important. In March 2026, discussions on the treatment of CCS were initiated within a study group on calculation methodologies under Greenhouse Gas Emissions Calculation, Reporting and Publication System (SHK system).<sup>11)</sup> This section introduces the treatment of CCS under the carbon footprint

framework, examined as part of our research on support measures for CCS projects in Japan.

### (1) Carbon footprint (CFP)

CFP<sup>12)</sup> is an initiative undertaken by companies to calculate, aggregate, and disclose the unit amount of greenhouse gas (CO<sub>2</sub>) emissions associated with a product or service across its entire lifecycle—from raw material procurement through manufacturing, distribution, use, and disposal. It serves as one of the foundational mechanisms for creating a market in which decarbonized and low-carbon products (green products) are preferentially selected. In general, CFP focuses on greenhouse gas emissions attributable to a company's own activities and is intended as an indicator for quantitatively evaluating its emission reduction efforts. Therefore, emission reductions achieved outside the defined system boundary of the CFP are typically not allowed to be offset through the purchase of external credits.

### (2) Treatment of CCS under the carbon footprint framework

With regard to CCS, CO<sub>2</sub> generated during the manufacturing stage of a product lifecycle is captured and stored underground, thereby reducing CO<sub>2</sub> emissions. Accordingly, it is expected that the amount of CO<sub>2</sub> reduced through CCS will be deducted when calculating the CFP of the relevant product.

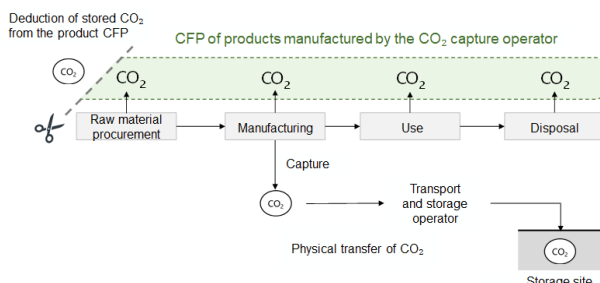


Figure 4 Relationship between CCS and CFP

Domestic and international frameworks related to the

treatment of CO<sub>2</sub> emission reductions in CFP accounting were surveyed and organized.

#### 1: Attribution of CO<sub>2</sub> emission reductions from CCS

According to the IPCC Guidelines for National Greenhouse Gas Inventories and National Greenhouse Gas Inventory Report of JAPAN, captured CO<sub>2</sub> is deducted from emissions in the source sector (i.e., the sector in which CO<sub>2</sub> is generated from fossil fuels) at the point when its permanent storage has been confirmed. In other words, the CO<sub>2</sub> emission reductions achieved through CCS are attributed to the CO<sub>2</sub> capture operator.

#### 2: Relevant frameworks for product CFP and attribute claims

Under frameworks such as the International Organization for Standardization (ISO) 14067, the EU Carbon Border Adjustment Mechanism (CBAM), and the CFP guidelines of the Japan Automobile Manufacturers Association (JAMA), CO<sub>2</sub> emission reductions achieved through CCS may be included in a product's CFP. In this context, it is permissible to issue certificates representing the amount of CO<sub>2</sub> reduction and to make attribute claims in order to associate these reductions with the product. Such attribute claims involve allocating and attributing CO<sub>2</sub> emission reductions generated within the product's lifecycle boundary, and therefore different in nature from offsetting, which involves compensating for emissions by purchasing or transferring reductions achieved outside the lifecycle boundary.

#### 3: Need for clarification under SHK system

Under current SHK system, it is already possible to deduct the amount of CO<sub>2</sub> captured. However, in order to achieve the self-sustaining development of CCS projects, it is necessary to ensure business predictability. In this context, discussions have started within the study group on calculation methodologies under SHK system to establish clear accounting rules for CCS, with the aim of promptly clarifying the value of CO<sub>2</sub> emission reductions achieved through CCS.

### 3. Promotion of international partnership

#### 3.1. IPCC (Intergovernmental Panel on Climate Change)

The IPCC has been established in 1988 with a view to conducting a comprehensive assessment from scientific, technical, and socio-economic perspectives on climate change, impact, adaptation and mitigation measures by anthropogenic sources, jointly by the United Nations Environment Program (UNEP) and by the World Meteorological Organization (WMO). The IPCC examines scientific knowledge on global warming and makes the reports prepared by three WGs, - Physical Science Basis (WG1), Impacts and Adaptation, and Vulnerability (WG2), and Mitigation Measures (WG3).

In the IPCC, the experts chosen among each country make the reports, based on the literature or the scientific observation data and evaluate / examine the scientific analysis, social economic influence and countermeasures to control climate change. This outcome is to have a high influence on international negotiations since the scientific basis is also given to the policies of each country.

RITE serve as the domestic supporting office for the Mitigation Working Group (Working Group III), playing a role in connecting research and development and analytical studies with policymaking (Figure 5). Within the IPCC, activities for the Seventh Assessment Cycle (AR7) commenced in July 2023. Work is currently underway on the Special Report on Climate Change and Cities, the Methodology Report on Short-Lived Climate Forcers (SLCFs), and the assessment reports of each Working Group.

In addition, an outline for the Methodology Report on Carbon Dioxide Removal (CDR) technologies and Carbon Capture, Utilization and Storage (CCUS) was approved at the IPCC Plenary in October 2025. Authors were selected in January 2026, and the report is now being drafted. RITE is providing support in this area as well, through activities such as information gathering,

analysis, reporting, and policy-relevant advice.

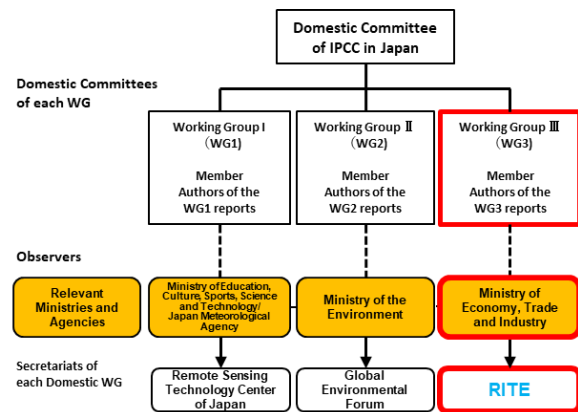


Figure 5 Committee structure and RITE

#### 3.2. ISO

ISO (International Standard Organization) is an organization composed of 176 standardization bodies of various countries that gives the common standards and promotes global trade. It can provide safe, reliable, and high-quality products/service by utilizing ISO standards.

In the world, a number of CCS verification projects on a commercial scale are implemented, and inter-national collaboration is under way. International standardization of CCS can contribute to the wide-spread of safe and appropriate CCS as it can ensure internationally agreed knowledge on safety and environmental aspects.

RITE is a domestic deliberation organization on ISO / TC 265 (Carbon dioxide capture, transportation, and geological storage) and is in charge of a secretariat of WG 1 (capture). Through these activities, we are actively involved in the international standardization on design, construction, operation, environmental planning and management, risk management, quantification, monitoring and verification, and related activities in the CCS field (Figure 6).

As of the end of March, 2026, seventeen standards related to the CCS have been published from ISO / TC265 and nine documents are currently under development.

In addition to these efforts, proposals for new topics

have been put forward and are now under consideration, indicating that overall activities within TC265 are becoming increasingly active. Revisions of standards published more than five years ago are also progressing, and a revised edition of ISO 27914, which addresses CO<sub>2</sub> storage as a whole, was published at the end of March. This standard was developed through a detailed review, conducted with the cooperation of relevant domestic companies, to verify that the overall revisions and the newly introduced CO<sub>2</sub> quantification for storage would not hinder practical implementation. The revised standard is expected to be utilized in future discussions toward the development of domestic rules for CO<sub>2</sub> storage.

*This activity is conducted as a commissioned project of the New Energy and Industrial Technology Development Organization (NEDO).*

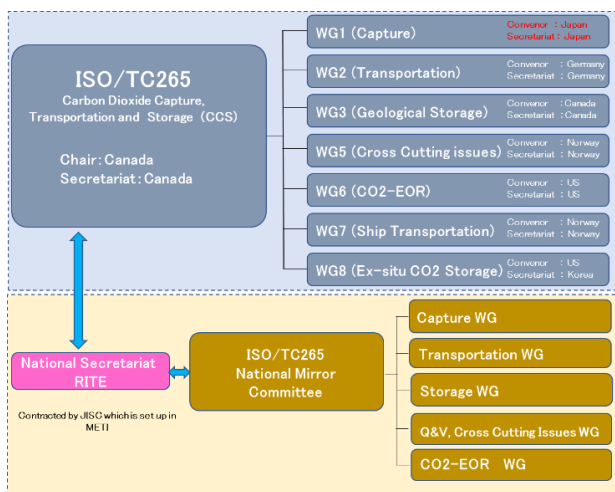


Figure 6 ISO/TC265 structure

#### 4. Public awareness promotion / Human resources development and industry collaboration

##### 4.1. Public awareness promotion / Human resources development

RITE is conducting various activities to promote public awareness and develop human resources with the aim of nurturing the next generation of researchers.

Here, we will explain our activities separately for elementary, junior high, and high school students and university/graduate students.

#### <Elementary, junior high, and high school students>

Believing that educating the next generation about global warming issues is important, RITE accepts elementary, junior high, and high school students for field trips to its laboratories and visits schools to give lectures. In fiscal 2025, RITE focused on CCS technology from among its research projects and explained to 128 students from seven schools the mechanism of global warming and that even if CO<sub>2</sub>, a major greenhouse gas, is stored underground, there is a low possibility of leakage due to the clay layer (shielding layer). Based on our learning cycle, we then deepened their understanding through reflection and exchange of opinions.(Figure 7).

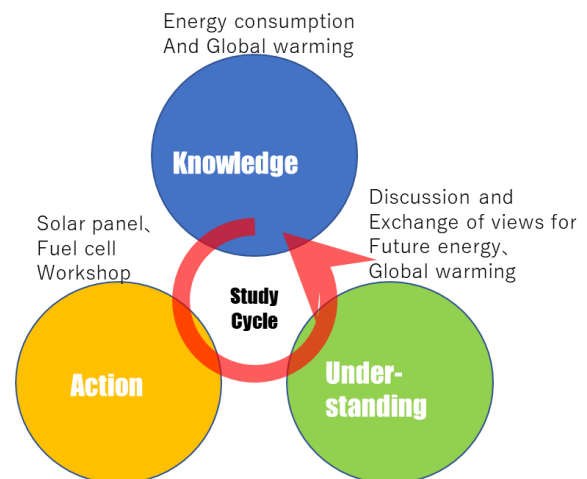


Figure 7 Human resource development by RITE (Elementary, Junior and high school students)

#### <University & Postgraduate student>

As part of efforts to develop human resources who will support next-generation research and technology, RITE promotes educational partnerships with universities and graduate schools. We are developing education at universities and re-search guidance at research institutes (Figure 8). For example, Nara Institute of Science and Technology (NAIST) has set up a university-collaborated laboratory in the bio-science field at RITE. We are

promoting research and education aimed at realizing are cycling-oriented and low-carbon society using renewable resources. In addition, we have established a collaborative laboratory with the materials creation science area of the NAIST, and are promoting research and education on CO<sub>2</sub> separation and recovery technology.

In addition, we believe that it is important to foster literacy related to climate change mitigation not only among researchers but also among students in the humanities. Accordingly, RITE provides lectures for first- and second-year humanities students at Kansai University, covering climate change mitigation in general as well as RITE's initiatives.

In this way, through a multifaceted approach targeting both science and humanities students, we aim to contribute to the development of individuals who will shoulder the future of research and development and who can also feel a sense of familiarity with it.

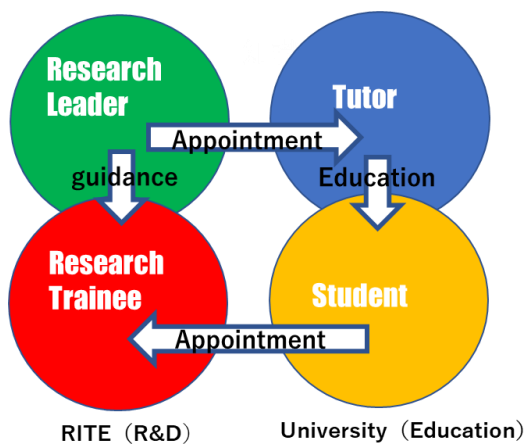


Figure 8 Human resource development by RITE (University & Post graduate students)

#### 4.2. Intellectual property and industry collaboration

RITE strategically and efficiently acquires and manages intellectual property rights such as patents and know-how regarding the results of research and development, etc., and actively utilizes them for the public interest. The aim is to advance and improve industrial technology that contributes to the conservation of the

global environment.

The acquisition of such research results as intellectual property creates opportunities for industrial collaboration with companies, etc., and through joint research and joint applications, further intellectual property is generated through a virtuous cycle that contributes to society. At RITE, we focus on the diverse functions of intellectual property rights and strategically promote intellectual property activities while taking into consideration the market and other research and development trends.

As part of the promotion of intellectual property strategies, the "Patent Deliberation Committee" was established with RITE executives as members and the public relations and industry collaboration team as the secretariat. The main agenda is the acquisition and management of intellectual property such as patent applications and examination requests, patent right maintenance, and intellectual property strategies such as approval of license agreements.

As of the end of March 2026, of the patents for which RITE is the sole or joint applicant, 22 domestic applications and 15 foreign applications are pending patent applications, and the registered rights are maintained. It holds 59 domestic patents (including 3 under license to companies) and 33 foreign patents (2 of which are licensed to companies).

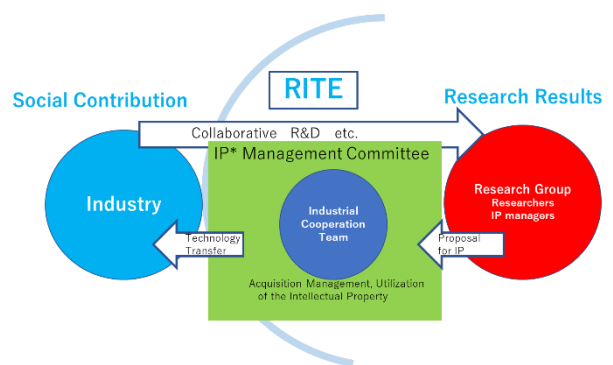


Figure 9 Strategic IP management and industrial collaboration

## 5. Conclusion

Since its establishment, RITE has promoted research and development of innovative energy and environmental technologies aimed at achieving substantial reductions in CO<sub>2</sub> emissions, while also developing climate change mitigation scenarios and translating them into policy recommendations.

Based on the domestic and international trends outlined above, RITE will continue to advance research and development in a timely and integrated manner, bringing these efforts to fruition as innovation, and striving to enable a lasting friendship between people and the earth.

In doing so, it is essential to foster social acceptance for the practical implementation of research and development achievements. RITE will therefore place emphasis on effective communication through various outreach tools, providing clear and convincing explanations, and further promoting awareness and understanding of climate change across diverse segments of society.

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