25-D-0388
June 27, 2025

Japan Credit Rating Agency, Ltd. (JCR) announces the review results of the Climate Transition Bond Framework Evaluation as follows.

The Government of Japan

Japan Climate Transition Bond Framework

Affirmation

Overall Evaluation	Greenness Evaluation (Use of Proceeds)	Management, Operation and Transparency Evaluation
Green 1(T)(F)	gt1(F)	m1(F)

Issuer	The Government of Japan
Subject	Japan Climate Transition Bond Framework

Evaluation Overview

1. Positioning of the Review

JCR has assigned a comprehensive evaluation of "Green 1(T)(F)" to the Japan Climate Transition Bond Framework (this Framework) formulated by the Government of Japan, as the result of the Japan Climate Transition Bond Framework appraisal on November 7, 2023. This review is conducted following the update of this Framework due to the formulation of the 7th Strategic Energy Plan, the Global Warming Measure Plan, and the GX2040 Vision in February 2025, along with the Government of Japan's additional allocation of funds.

2. Overview of the Transition Strategy

The Government of Japan, considering the goals set by the Paris Agreement (to keep the global temperature rise well below 2°C, and continue efforts to limit the increase to 1.5°C), declared

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

"Carbon Neutrality by 2050" in October 2020. This was later legislated with the amendment of the Act on Promotion of Global Warming Countermeasures in the following year. In April 2021, as an interim target towards net zero by 2050, it was declared that Japan aims to reduce its greenhouse gas emissions by 46% in fiscal year 2030 from its fiscal year 2013 levels, and will continue strenuous efforts in its challenge to meet the lofty goal of cutting its emission by 50%. Additionally, in February 2025, a revision of the Basic Plan for Global Warming Countermeasures was conducted, specifying the aim to achieve a 60% reduction in FY2035 and a 73% reduction in FY2040, compared to FY2013 levels. These targets have been submitted to the Secretariat of the United Nations Framework Convention on Climate Change as Japan's NDC (Nationally Determined Contribution).

Just under 90% of Japan's GHG emissions are energy-related CO_2. Hence, to achieve the targets set for each fiscal year in the NDC, it is important to steadily implement specific decarbonization measures in the industrial, commercial, transportation, and residential sectors, based on the country's strategic energy plan and energy mix. In the 6th Strategic Energy Plan approved by the Japanese Cabinet in October 2021, the Government of Japan introduced the concept of "Green Transformation (GX)," aiming to shift the industrial and social structures from being centered on fossil energy, which has been the focus since the Industrial Revolution, to centering on clean energy. Starting in 2022, the GX Implementation Council was held with the Prime Minister as the chairperson and experts from the public, private, and academic sectors participating. By 2023, they had compiled the "Basic Policy for Realizing GX." Furthermore, the GX Promotion Act and the GX Decarbonized Power Act were enacted in the same year, establishing a system for promoting initiatives toward the "Pro-Growth Carbon Pricing Concept." Also, as a concrete strategy for the implementation of a series of policies, the "GX Promotion Strategy" was approved by the Cabinet in July 2023 based on the GX Promotion Law. In addition, in February 2025, the "7th Strategic Energy Plan" will be approved by the Cabinet, and the "GX 2040 Vision" will be formulated as a revision of the GX Promotion Strategy.

The specific initiatives undertaken by the Government of Japan include thorough energy efficiency improvement and fuel switching within the manufacturing, while maximizing the use of decarbonized power sources such as renewables and nuclear power, both of which contribute to energy security.

▶▶▶ 3. Validity on Transition Strategy (Outline of Alignment Evaluation with CTFH)

The transition strategy and specific policies in Japan meet the four components in the Climate Transition Finance Handbook [1] and the Basic Guidelines for Climate Transition Finance [2] (hereinafter collectively referred to as "CTFH and so forth.") Furthermore, the Government of Japan's transition strategy involves calling for a 150 trillion-yen investment from both the public and private sectors over 10 years. This is to achieve net zero by 2050 and to meet the interim targets for FY2030, FY2035, and FY2040 (with a reduction of 46%, 60%, and 73% FY2013). By preceding this Framework with government-implemented investments, they intend to

[1] ICMA (International Capital Market Association) (2023) *Climate Transition Finance Handbook* https://www.icmagroup.org/sustainable-finance/the-principles-guidelines-and-handbooks/climate-transition-finance-handbook/

[2] Financial Services Agency, Ministry of Economy, Trade and Industry, Ministry of the Environment (2025) *Basic Guidelines for Climate Transition Finance* https://www.meti.go.jp/policy/energy_environment/global_warming/transition/basic_guidelines_on_climate_transition_finance_jpn_2025.pdf

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

stimulate Green Transformation (GX) investment. These measures exceed the traditional framework (Business As Usual), and JCR evaluates them as a highly ambitious strategy.

Also, the target of the Government of Japan is set as a target consistent with the goals of the Paris Agreement (significantly below 2°C, aiming for a maximum of 1.5°C). JCR evaluates that, even when compared by aligning with other countries' target values and base years, it is at a relatively ambitious level.

▶▶▶ 4. About the Climate Transition Bond Framework

The subject of this evaluation is Japan Climate Transition Bond Framework (the "Framework") published by Japan to use the proceeds only to expenditures to the projects to improve environment. JCR evaluates whether this Framework aligns with the Green Bond Principles[3], the Green Bond Guidelines[4] and CTFH and so forth. These principles and guidelines are voluntarily published by the International Capital-Marketing Association (ICMA) and the Ministry of Environment, respectively, and are not legally regulated based on evidence. JCR however refers these principles and guidelines as they are referred to as unified standards domestically and globally.

As of November 2023, the Government of Japan has defined the use of proceeds under this Framework as research and development funding and/or subsidy programs for projects in fields specified by the GX Promotion Strategy that contribute to Japan's GX, and that meet the basic conditions set forth by the same strategy. It should be noted that while many of the eligible projects are research and development funding and grant programs with a low likelihood of directly causing negative impacts on the environment and society, it is planned to verify the negative impacts on the environment and society during the evaluation and selection of individual eligible projects.

This time, the Government of Japan, based on the progress made in various sectors, has added eligible business examples related to energy efficiency, low-carbon/decarbonized energy, clean transportation, environmentally adaptive products, and environmentally considerate production technologies and processes. Furthermore, in the domain of low-carbon and decarbonized energy, the funds will newly include support for long-term and large-scale continuous investments by electric power companies in renewable energy and nuclear power generation. Regarding all these initiatives, JCR continues to promote Japan's overall Green Transformation (GX) efforts and evaluates them as contributing to the achievement of net zero by 2050 and the interim targets for fiscal years 2030, 2035, and 2040.

Additionally, JCR has confirmed that there have been no substantial changes and that it is appropriately set since the last evaluation concerning the project selection process, financial management system, and reporting defined in this Framework by the Government of Japan. Therefore, JCR evaluates that the management and operational structure within the Government of Japan is well established and continues to possess high transparency.

[3] ICMA (2025) Gre*en Bond Principles*
https://www.icmagroup.org/sustainable-finance/the-principles-guidelines-and-handbooks/green-bond-principles-gbp/
[4] Ministry of the Environment (2024) *Green Bond Guidelines*
https://www.env.go.jp/content/000128193.pdf

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

Based on JCR Green Finance Evaluation Methodology, JCR assigned "gt1(F)" for "Green/Transition Evaluation (Use of Proceeds)" and "m1(F)" for "Management, Operation and Transparency Evaluation." As a result, JCR assigned "Green 1(T)(F)" for the overall "JCR Climate Transition Bond Framework Evaluation."

The Framework meets the standards for the items required in the Green Bond Principles, the Green Bond Guidelines and CTFH and so forth.

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

Table of contents

■Review Items

■Review Content

1. Compatibility with the CTFH and so forth
2. The Use of Proceeds
3. Selection Standards and Processes for Use of Proceeds
4. Management of the Proceeds
5. Reporting
6. Organization's Environmental Initiatives

■Review results (Conclusion)

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

Review Items

This section lists the items that should be confirmed in the review of the framework. In the review, focused confirmation is conducted on the items whose content has changed compared to the previous evaluation.

1. Compatibility with the CTFH and so forth

Does the issuer's transition strategy, after any changes, still align with the CTFH and so forth?

2. The use of procured funds.

After the revision, do the classification of qualified criteria and usage of funds for climate transition finance continue to possess green/transition features?

3. Criteria and process for selecting the use of funds

Are the goals the organization aims to achieve through climate transition finance, the eligibility criteria for green/transition projects, the validity of that process, and the entire sequence of processes still appropriate?

4. Management of procured funds

Is there an ongoing appropriate mechanism and internal system to ensure that the funds raised through climate transition finance are definitely allocated to green/transition projects, and that the allocation status is easily trackable and manageable?

5. Reporting

Whether the systems are in place for reporting on the allocation of funds and impact reporting related to climate transition finance to continue being adequately disclosed through the methods determined by the issuer at the time of receiving the climate transition finance evaluation, also following framework changes.

6. The organization's efforts on environmental issues

Whether the organization continues to position sustainability as a high-priority important issue.

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

Review content

1. Compatibility with the CTFH and so forth.

1-1. Japan's Economic Policy and Transition Strategy

< Overview: Political and Social Situation>

Japan is located off the coast of the Far East and East Asia at the eastern end of the Eurasian Continent and the coastal areas in northwestern part of the Pacific Ocean, and it is island arcs as a whole. The land area is roughly 378,000 km2, approximately 70 per cent of which is mountainous terrain that include roughly 67 per cent of forests and it ranks 62nd in the world. Natural disasters, such as earthquakes or typhoons has hit Japan more often than the rest of the world. While Japan's land area accounts for only about 0.29 per cent in the world, 18.5 per cent of earthquakes with a magnitude of 6 or higher have occurred in Japan since 7.1 per cent of the world's active volcanoes are located in Japan where there are many active faults.

Further measures from both mitigation/adaptation to climate change are urgent and the most important issues since many damage has recently occurred due to earthquakes and intensifying storms and floods disasters although the national government strives to make the country more resilient to climate change and earthquakes.

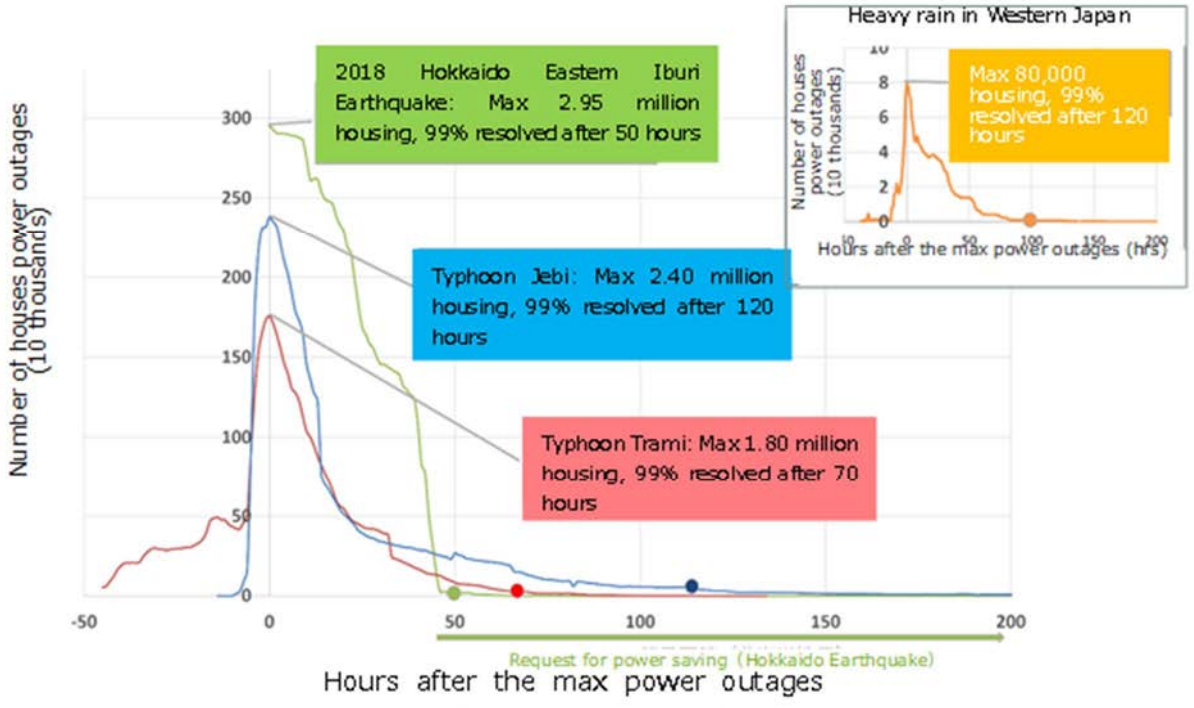


Figure 1: The number of power outages and time taken to resolve in each disaster[5]

The Japanese GDP in 2023 ranked forth after the United States, China and Germany thanks to a large number of internationally competitive manufacturing companies. According to the 2023 White Paper on Manufacturing Industries, Japan has 825 major manufacturing items in 2020 of

[5] Agency for Natural Resources and Energy at https://www.enecho.meti.go.jp/about/special/johoteikyo/blackout.html

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

which 220 items hold 60 per cent or more global market shares, a predominantly high number, compared to the United States (99 items,) Europe (50 items) and China (45 items.) Roughly 70 per cent of the items are parts/materials, including electronics or automobiles, which is the strength of the Japanese manufacturing industry.

The total amount of GHG emissions in Japan with the thriving manufacturing industry, was 1.071 billion tons-CO_{2e} as of FY2023, ranked the seventh[6] largest in the world; however, the actual amount in FY2023 was reduced by approximately 23.3 per cent from FY2013. Of which, the total CO_2 emissions amounted to 989 billion tons-CO_2, and 93.2 per cent of the emissions are resulting from energy use. The breakdown by sector is as follows: the energy transformation sector, 40.1 per cent; the industrial sector (the iron and steel, chemical and allied products and other industry), 24.7 per cent; the transportation sector, 18.5 per cent; the commercial industry, etc. sectors, 5.1 per cent and the residential sector, 4.7 per cent (Figure 2, before electricity and heat distribution.)

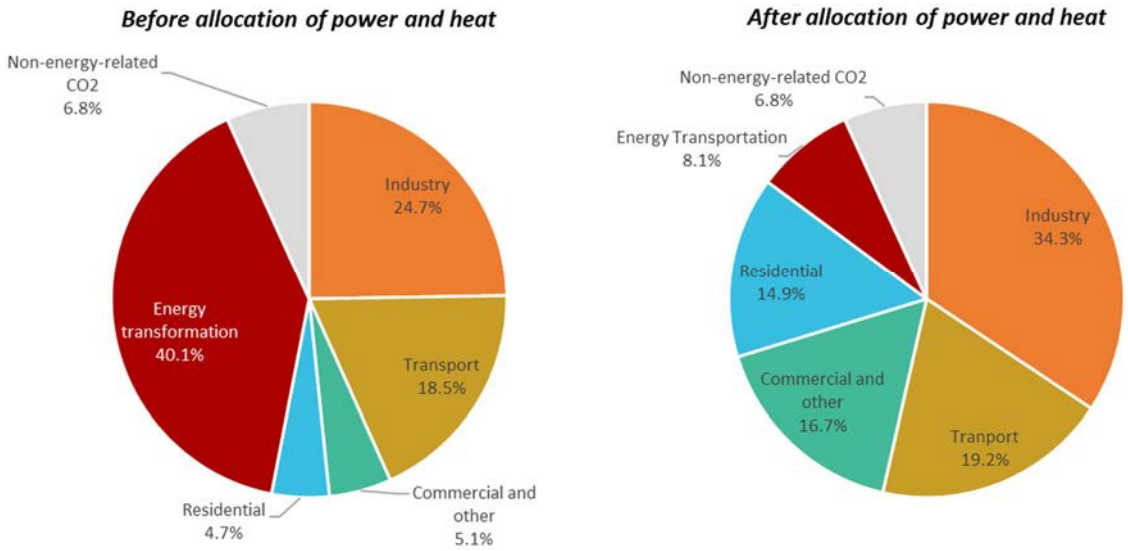


Figure 2: Breakdown of CO_2 emissions by sector (FY2023)[7]

The Government of Japan has aggressively led the decarbonization initiatives in the international community with ambitious developmental promotion of solid/new technologies by discussing over global promotion of GX that is a transformation of the entire economic and social system so as to shift to the clean energy-centered economy, society and industrial structure from the fossil fuel-centered since the Industrial Revolution, based on the spirit of the Paris Agreement and furthermore to integrate carbon neutral, a circular economy and nature revival by accelerating the measures against climate change in the whole world and by compiling an agreement, stating to aim to keep the global temperature rise below 1.5 °C in the "G7 Sapporo

[6] Emissions Database for Global Atmospheric Research(EDGAR) "Emissions Database for Global Atmospheric Research" data in 2022

[7] Created by JCR based on the Ministry of the Environment's "Japan's National Greenhouse Gas Emissions and Removals in FY 2023"

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

Climate, Energy and Environment Ministers' Meeting" as its host country in the G7 Hiroshima Summit in May 2023.

In addition, it has expressed the intention to deepen cooperation with Asia through the Asian Zero Emission Community (AZEC) for the spread of transition to other Asian countries with a high dependence on fossil fuels, similar to Japan. Particularly under the "Asia Energy Transition Initiative" (AETI), it aims to establish transition finance in Asia by accelerating the financing of transition technologies and projects. This is done through supporting the development of decarbonization roadmaps and creating a transition technology list, working to improve the investment environment led by the Asia Transition Finance Study Group (ATF SG) of private financial institutions, building cooperative systems with government authorities and international organizations based on cooperation memorandums concluded with Asian Development Bank (ADB) and Economic Research Institute for ASEAN and East Asia (ERIA) by the Ministry of Economy, Trade and Industry, and supporting the development of human resources in the energy transition sector.

<Plan for Global Warming Countermeasures>

The Government of Japan and set out the basic principles for promoting global warming countermeasures, such as realizing decarbonized society for net-zero by 2050, the integrated improvement of the environment, economy and society and the close cooperation with citizens and other parties concerned in the Act on Promotion of Global Warming Countermeasures revised in March 2021,based on goals set forth in the Paris Agreement (keep the global temperature rise well below 2 °C and to pursue efforts to limit the temperature increase even further to 1.5 °C). It is announced that Japan aims to reduce its greenhouse gas emissions by 46% in fiscal year 2030 from its fiscal year 2013 levels, and will continue strenuous efforts in its challenge to meet the lofty goal of cutting its emission by 50% in the Plan for Global Warming Countermeasures revised in October 2021, based on the revised Act on Promotion of Global Warming Countermeasures.

In February 2025, a revision of the aforementioned Plan for Global Warming Countermeasures was carried out, setting targets for fiscal years 2035 and 2040. According to it, Japan aims to reduce its GHG by 60% in fiscal year2035 and by 73% in fiscal year 2040, respectively, from its FY2013 levels. Currently, the trend of Japan's GHG emissions is as shown in Figures 3 and 4. The total GHG emissions for the FY 2023 amounted to 1.071 billion tons-CO_{2e}, which is approximately a 23.3% reduction (324.40 million tons-CO_{2e}) compared to the total emissions of the FY2013 (1.395 billion tons-CO_{2e}).

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

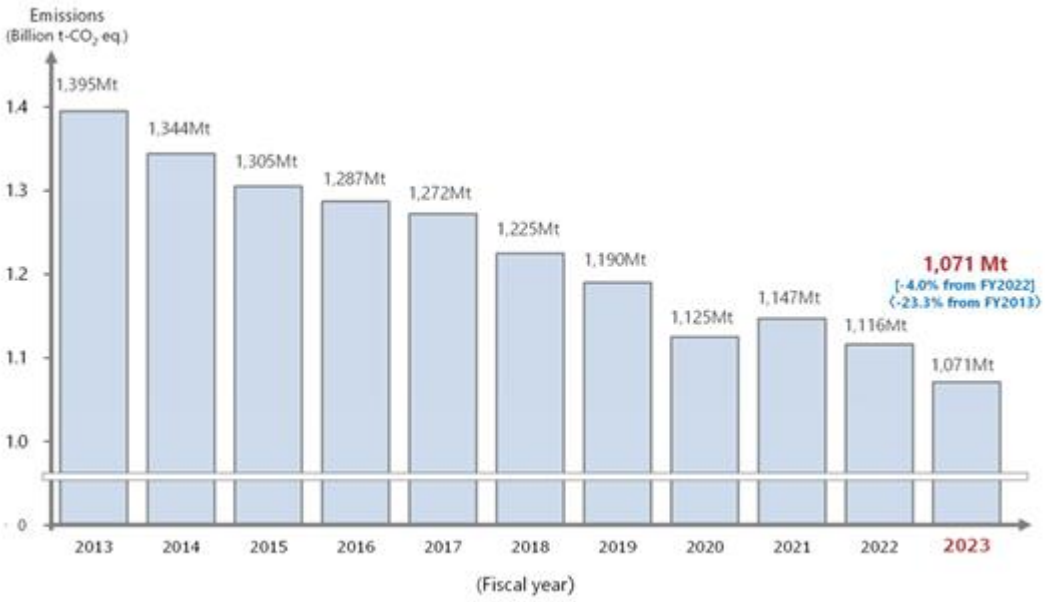


Figure 3 : Changes in Japan's total GHG emissions[8]

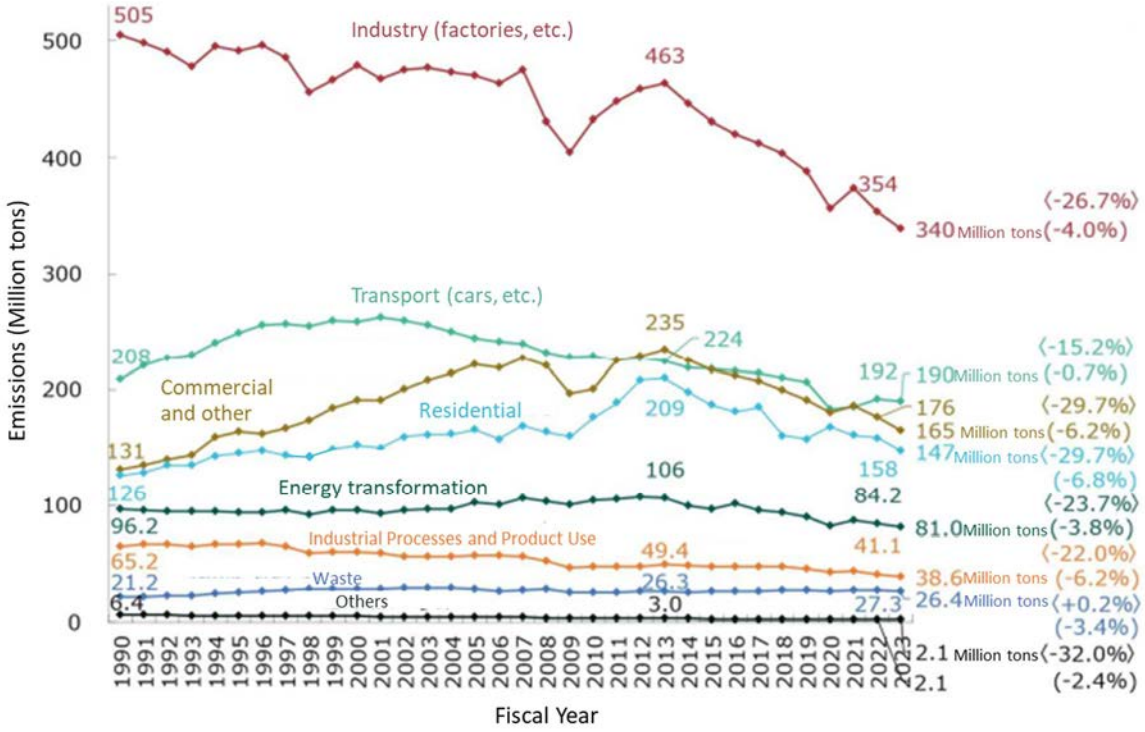


Figure 4: Trends in Japan's CO_2 Emissions by Sector[9]

The reduction targets were established for FY2030 and FY2040 by GHG and by division for energy-derived CO_2 in the Plan for Global Warming Countermeasures (see Figure 5, next page.)

[8] Source: the Ministry of the Environment's "Japan's National Greenhouse Gas Emissions and Removals in Fiscal Year 2023"
[9] Source: the Ministry of the Environment's "Japan's National Greenhouse Gas Emissions and Removals in Fiscal Year 2023" (Translated by JCR)

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

Some examples of measures that are expected to be taken by the national and local governments for respective emission sources or targets by division were also set forth with the specific reduction figures in this plan.

(Unit: Million t-CO_2)

	Actual for FY 2013[1]	FY 2030[2] (compared to FY 2013)	FY 2040[3] (compared to FY 2013)
Greenhouse gas emissions and removals	1,407	760 (▲46%[4])	380 (▲73%)
Energy-related CO_2	1,235	677 (▲45%)	Approx. 360-370 (▲70-71%)
Industry	463	289 (▲38%)	Approx. 180-200 (▲57-61%)
Commercial and others	235	115 (▲51%)	Approx. 40-50 (▲79-83%)
Residential	209	71 (▲66%)	Approx. 40-60 (▲71-81%)
Transport	224	146 (▲35%)	Approx. 40-80 (▲64-82%)
Energy conversion[5]	106	56 (▲47%)	Approx. 10-20 (▲81-91%)
Non-energy-related CO_2	82.2	70.0 (▲15%)	Approx. 59 (▲29%)
Methane (CH_4)	32.7	29.1 (▲11%)	Approx. 25 (▲25%)
Nitrous oxide (N_2O)	19.9	16.5 (▲17%)	Approx. 14 (▲31%)
Four gases incl. alternative CFC[6]	37.2	20.9 (▲44%)	Approx. 11 (▲72%)
Hydrofluorocarbons (HFCs)	30.3	13.7 (▲60%)	Approx. 6.9 (▲77%)
Perfluorocarbons (PFCs)	3.0	3.8 (+26%)	Approx. 1.9 (▲37%)
Sulfur hexafluoride (SF_6)	2.3	3.0 (+27%)	Approx. 1.5 (▲35%)
Nitrogen trifluoride (NF_3)	1.5	0.4 (▲70%)	Approx. 0.2 (▲85%)
Greenhouse gas removals	–	▲47.7	▲Approx. 84[7]
Joint Crediting Mechanism (JCM)	–	Japan aims to contribute to international emission reductions and removals at the level of a cumulative total of approximately 100 million t-CO_2 by fiscal year 2030 through public-private collaborations. Japan will appropriately count the acquired credits to achieve its NDC.	Japan aims to contribute to international emission reductions and removals at the level of a cumulative total of approximately 200 million t-CO_2 by fiscal year 2040 through public-private collaborations. Japan will appropriately count the acquired credits to achieve its NDC.

Figure 5: Japan's GHG Emission Reduction Targets and guidelines by GHG and other categories[10]

<GX2040 Vision(Act for Promoting a Smooth Transition to a Decarbonized Growth-Oriented Industrial Structure, Amended) >

As shown in Figure 5, almost 90% of Japan's total GHG emissions originate from energy-related CO_2. From this, it is important to steadily implement specific decarbonization measures for the industrial, business, transportation, and household sectors, based on the national energy basic plan and energy mix, to achieve the targets set for each year. In the 6th Strategic Energy Plan decided by the Government of Japan in a cabinet meeting in October 2021, the government introduced the concept of "Green Transformation (GX)" which aims to shift the industrial and

[10] Source: the Plan for Global Warming Countermeasures ((February 18th 2025 Cabinet Decision) https://www.env.go.jp/earth/ondanka/keikaku/250218.html)

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

social structures centered on fossil energy since the Industrial Revolution to those centered on clean energy. Starting in 2022, the GX Implementation Council chaired by the Prime Minister and composed of experts from government, private sector, and academia was held, and in 2023, the "Basic Policy for Realizing GX" was compiled. Furthermore, the GX Promotion Law and the GX Decarbonization Power Law were enacted in the same year, establishing a framework for promoting initiatives toward the "Pro-Growth Carbon Pricing Concept." Also, as a concrete strategy for the implementation of a series of policies, the "GX Promotion Strategy" was approved by the Cabinet in July 2023 based on the GX Promotion Law.

The 7th Strategic Energy Plan approved by the Cabinet in February 2025 highlights changes since the 6th Strategic Energy Plan, such as the Russian invasion of Ukraine, increased economic security demands due to tensions in the Middle East, and increased power consumption due to green transformation (GX) and digital transformation (DX). It emphasizes that securing decarbonized power sources at internationally competitive prices is directly linked to Japan's industrial competitiveness. The plan discusses aiming for a balanced power supply composition that avoids excessive dependence on specific sources or fuels, from the perspective of simultaneously ensuring a stable energy supply and decarbonization. It aims to maximize the use of renewable energy, nuclear power, and other power sources that contribute to energy security and have high decarbonization effects.

In addition, regarding the GX Promotion Act, a revised law that includes the legalization of the emissions trading system, the implementation of concrete measures for collecting fossil fuel surcharges, and the establishment of financial support for the GX field was enacted in May 2025. Furthermore, the GX Promotion Strategy has been revised in February 2025 as the "GX2040 Vision," taking into account the increased possibility of power demand in line with the intensification of international affairs and the progress of GX and DX.

Table 1: Overview of the GX2040 Vision 1.1[11]

<table>
<tr><td colspan="2">1. Overall Picture of the GX2040 Vision</td></tr>
<tr><td colspan="2">With heightened uncertainty about future outlooks due to factors such as Russia's invasion of Ukraine, increased tensions in the Middle East, advances in digital transformation, and increased electricity demand from electrification, a longer-term direction is shown to enhance the foreseeability of investments towards Green Transformation (GX).</td></tr>
<tr><td>2. GX Industrial Structure</td><td>5. Initiatives in Individual Fields to Accelerate GX</td></tr>
<tr><td>・ ① New GX businesses leveraging innovative technologies are emerging one after another, and ② a full-set supply chain aims to realize an advanced industrial structure through the use of decarbonized energy and DX.
・ To achieve the above, we will promote the social implementation of innovation, market creation leading to the GX industry, and the GX of medium and small enterprises.</td><td>- Accelerate GX initiatives for individual sectors (energy, industry, living, etc.) based on sectoral investment strategies and the Strategic Energy Plan.
- Demonstrate effectiveness in reducing emissions through the supply and utilization of recycled materials. Toward the establishment of a growth-oriented resource-autonomous economy, a bill to amend the Resource Promotion Act is scheduled to be submitted to the regular Diet session in 2025.
3.</td></tr>
<tr><td>3. GX Industrial Location</td><td>6. Pro-Growth Carbon Pricing Concept</td></tr>
<tr><td>- In the future, the GX industry, which generates added value by utilizing clean energy such as decarbonized power, is expected to drive growth.
- Taking into account the regional disparity of clean energy, the goal is to efficiently and effectively promote the</td><td>A proposal to amend the GX Promotion Act is planned to be submitted at the ordinary session of the Diet in 2025.
- Full-scale operation of the Emission Trading System (from FY 2026)
➢ Companies with emissions above a certain scale (direct</td></tr>
</table>

[11]Summary and creation by JCR from Ministry of Economy, Trade, and Industry disclosure materials

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

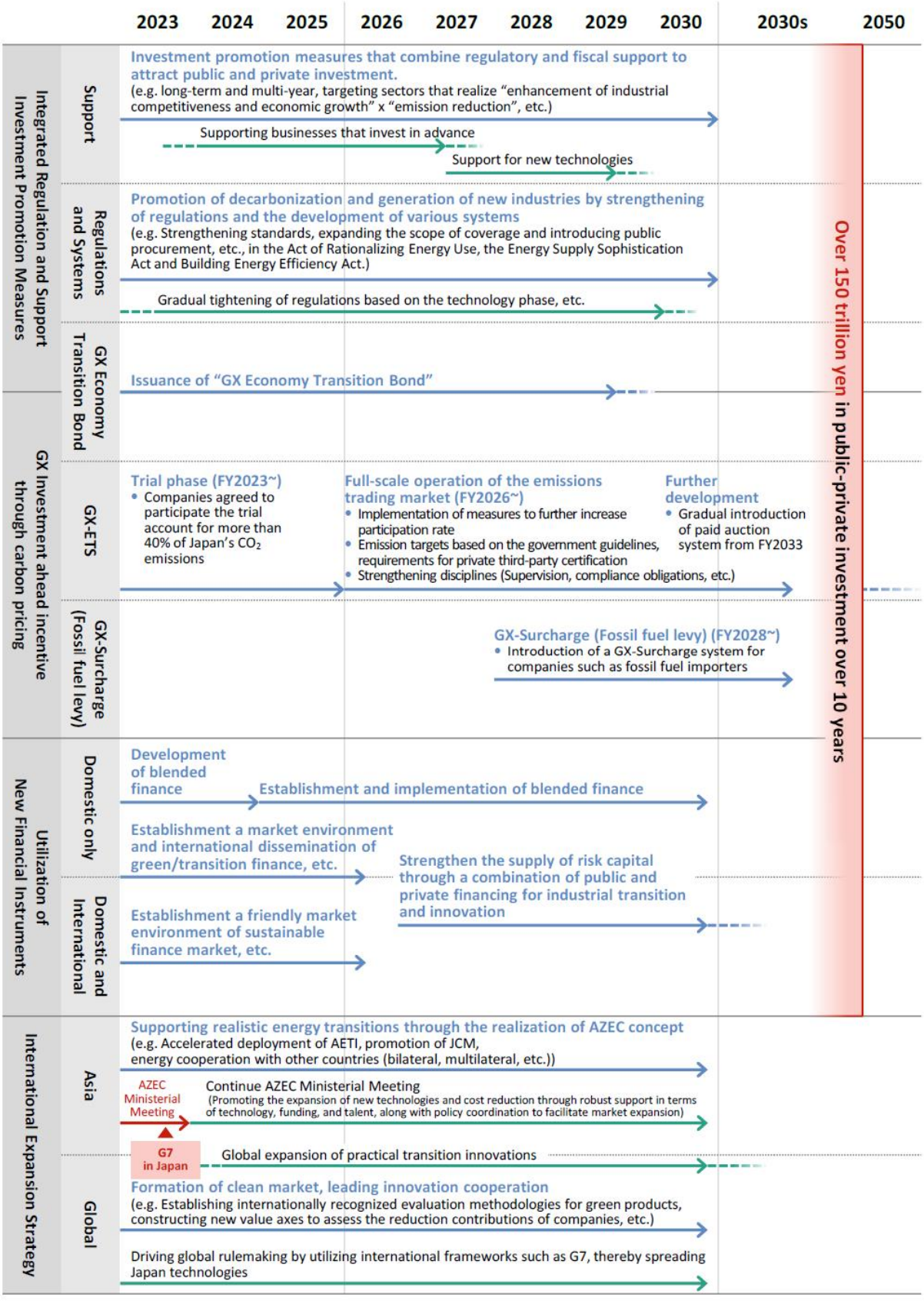
development of "new industrial sites" and "decarbonized energy sources" to connect with regional revitalization and economic growth.	emissions of 100,000 tons) are uniformly required to participate, regardless of industry, etc. ➢ Emission allowances are allocated free of charge to target businesses, considering industry characteristics, etc. ➢ Setting upper and lower price limits for emission allowances to ensure predictability. - Introduction of a fossil fuel levy (from FY 2028) ➢ Establish necessary measures for smooth and reliable introduction and execution.
4. Importance of a realistic transition and contribution to global decarbonization.	7. Just Transition
Just transition ・While proceeding with coordinated efforts towards NZ 2050 across nations, it's necessary to pursue a realistic transition. ・Contribute to the global decarbonization of countries through initiatives such as AZEC.	- In advancing GX, from the perspective of a fair transition, necessary efforts such as labor mobility to new emerging industries will be promoted.
8. On the progress and review of the implementation status of policies related to GX	
- Progress reports will continue to be made at appropriate venues, including future sessions of the GX Implementation Council, and revisions will be conducted effectively as needed.	

The revised GX2040 Vision mentions presenting a more long-term direction to enhance the predictability of investments towards GX, considering the increased uncertainty regarding future prospects, taking into account the 7th Strategic Energy Plan. Also, the revised GX2040 Vision sets a chapter which indicate how to address the concept of a "just transition."

The GX2040 vision includes the full-fledged system design of carbon pricing, such as the concretization of emissions trading, as well as the system design of the "circular economy" market that contributes to security, such as securing rare resources. In addition, the document highlights industrial sector initiatives focusing on creating new GX businesses utilizing innovative technologies through investments in the GX field, and establishing a supply chain from materials to products through the advanced use of decarbonized energy and digital transformation (DX). In addition, the efforts aim to link regional revitalization and economic growth by focusing on the utilization of decarbonization energy, such as renewable energy and nuclear power, which are regionally concentrated in terms of industrial location. The GX2040 vision calls for a transition to the GX industry at an opportune time, efficiently and effectively with a sense of urgency, advancing the development of new industrial sites and decarbonized power sources, aiming for future regional revitalization and economic growth.

Furthermore, it is also stated that by promoting GX among medium-sized and small enterprises, there is a need to advance GX throughout society while supporting the growth of these businesses. Support includes assistance with easily calculating and visualizing energy consumption and emissions, support for introducing energy-saving equipment, support for developing innovative products and services contributing to GX, and promoting the establishment of a push-type regional support system where financial institutions and support organizations collaborate to provide assistance. Additionally, in order to contribute to rule formation from an Asian perspective and to the world's decarbonization, it is specifically mentioned that efforts will be made to expand the dissemination of transition finance in Asia, for example.

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.



Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

Figure 6 : Overview of the GX Policy Roadmap[12]

Furthermore, initiatives that were described in the GX Promotion Strategy, such as the thorough promotion of energy conservation, the use of renewable energy, and nuclear power, will continue to be pursued. It is emphasized that it is important to make the most of both renewable energy and nuclear energy as decarbonization energy. Furthermore, strategies to tackle aspects lacking for realizing a decarbonized society include utilizing nuclear energy, commercializing next-generation clean energies such as hydrogen, ammonia, synthetic fuels, and synthetic methane, resource circulation, and other important matters. These are all measures based on technical evidence, and the combinations of technologies expected for each cross-section in 2023, 2030, 2040, and 2050 have been compiled as "Future milestones" into 22 categories. Furthermore, regarding the "Future milestones," the Government of Japan conducted major classifications in December 2023 and compiled the directions for GX and investment promotion measures utilizing GX Economy Transition Bonds for 16 key areas, which were released as a "Sector-specific Investment Strategies." In the "Sector-specific Investment Strategies," specific projects and a leading five-year action plan regarding the measures stipulated in the "Future milestones" are compiled with the aim of establishing a GX market domestically and innovating the supply chain to a GX model. Furthermore, the "Sector-specific Investment Strategies" are formulated at the GX Implementation Council, chaired by the Prime Minister, after being discussed in detail over CO_2 reduction effects, economic rationality, and the feasibility of social implementation by a working group of experts.

Moreover, the "Future milestones" and the broad outlines of the roadmap set in the "Sector-specific Investment Strategies" align with the sector-specific roadmap for transition finance ("Technology Roadmap") developed by the Ministry of Economy, Trade and Industry. Technology Roadmaps by sector have been formulated sequentially starting from the FY 2021, targeting industries with relatively large CO_2 emissions, such as steel, chemicals, electric power, gas, oil, paper & pulp, cement, and automobiles, across 16 sectors. The document outlines the low-carbon and decarbonization technologies that each sector aims to integrate by 2050 for achieving net zero. it covers both existing technologies and those under development, targeted for social implementation. Through the combination of these technologies, a path is presented to align with the 1.5 to 2°C target of 2030 and to achieve net zero by 2050.

[12] Source: this Framework

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

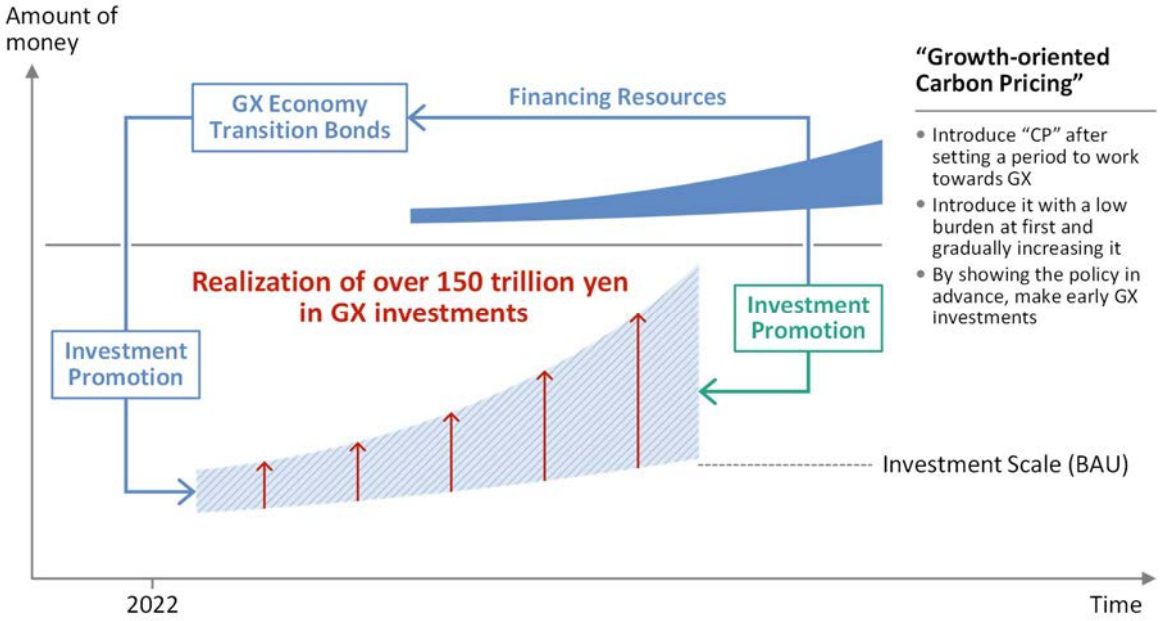


Figure 7: 150 trillion-yen investment in the GX2040 vision[13]

<The Importance of a Decarbonization Transition Strategy in Japan (Materiality)>

The Government of Japan positions the GX initiative as a critical policy for reinforcing Japan's industrial competitiveness by securing a stable energy supply through the transformation of the fossil energy-centric industrial and social structures, established since the Industrial Revolution, into ones centered on clean energy. At the same time, it aims to create new demand and markets in the decarbonization field. "Basic Policy on Economic and Fiscal Management and Reform 2024" and "Grand Design and Action Plan for a New Form of Capitalism" position "GX and Energy Security" as one of the five initiatives to address social challenges through the expansion of investment and the societal implementation of innovative technologies, aiming for sustainable economic growth through addressing social issues.

Table 2: Content of the Basic Policy on Economic and Fiscal Management and Reform 2024[14]

I. Transition to a New Growth-oriented Economic Stage In the face of historical and structural changes and challenges, both domestic and international, which can be said to be the "turning point of the era" for Japan, we will advance bold reforms.	
II (1) "Income growth" and wage increases that can be felt richly	II (2) Revitalization of small and medium-sized enterprises that support richness

[13] Source: Materials provided by the Ministry of Economy, Trade and Industry
[14] Prepared by JCR from the Cabinet Office's Basic Policy on Economic and FY Management and Reform 2024 website

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

II (3) Responding to social issues through the expansion of investment and social implementation of innovative technologies (1) DX (2) GX and Energy Security - Formulation of the "GX National Strategy" and revision of the "Strategic Energy Plan", etc., aiming for completion by FY 2024 - Promotion of energy-saving support, expansion of renewable energy introduction, utilization of nuclear energy, social implementation of low-carbon hydrogen, etc. - Realization and execution of the Pro-Growth Carbon Pricing Concept, realization of the AZEC concept, and technological development of domestic marine resources (3) Exploration of Frontiers (4) Promotion of Science and Technology, and Innovation (5) Asset Management Nation	II(4) Addressing Social Challenges through Formation of Startup Networks and Improved Connectivity with Overseas Economies
II(5) Regional Revitalization and Addressing Social Challenges in Local Areas	II(6) Realization of an Inclusive Society Where Happiness is Felt
II(7) Responding to International Environmental Changes as a Foundation for Sustainable Economic Growth	II(8) Promotion of Disaster Prevention, Mitigation, and Strengthening National Resilience
III. Realization of a Sustainable Economic Society in the Mid to Long Term ~ "Economic and FY Revitalization Plan" ~	

<Governance>

The execution of GX in Japan is discussed in the GX Implementation Council, chaired by the Prime Minister and attended by relevant ministers and experts, after which the policy directions are determined. The members of the GX Executive Meeting include experts from the industrial and financial sectors. Additionally, the Cabinet Secretariat is overseeing the coordination in the operation of the GX Implementation Council. In addition, the details of the "investment promotion measures" utilizing GX Economy Transition Bonds have been discussed and developed by the GX Expert Working Group. Furthermore, under the GX Implementation Council, a separate conference for liaison among relevant government offices concerning the GX Economy Transition Bonds has been established.

Regarding Japan's GHG emissions and removals, review process is carried out every year in accordance with the "Plan for Global Warming Countermeasures" over various sectors such as energy conversion, industry, transportation, residential, etc. The plan is then endorsed at the Global Warming Prevention Headquarters, participated in by all cabinet ministers, and is being promoted.

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

In addition, various strategies related to promoting GX will be reviewed as necessary and appropriately, considering the necessity and changes in the external environment.

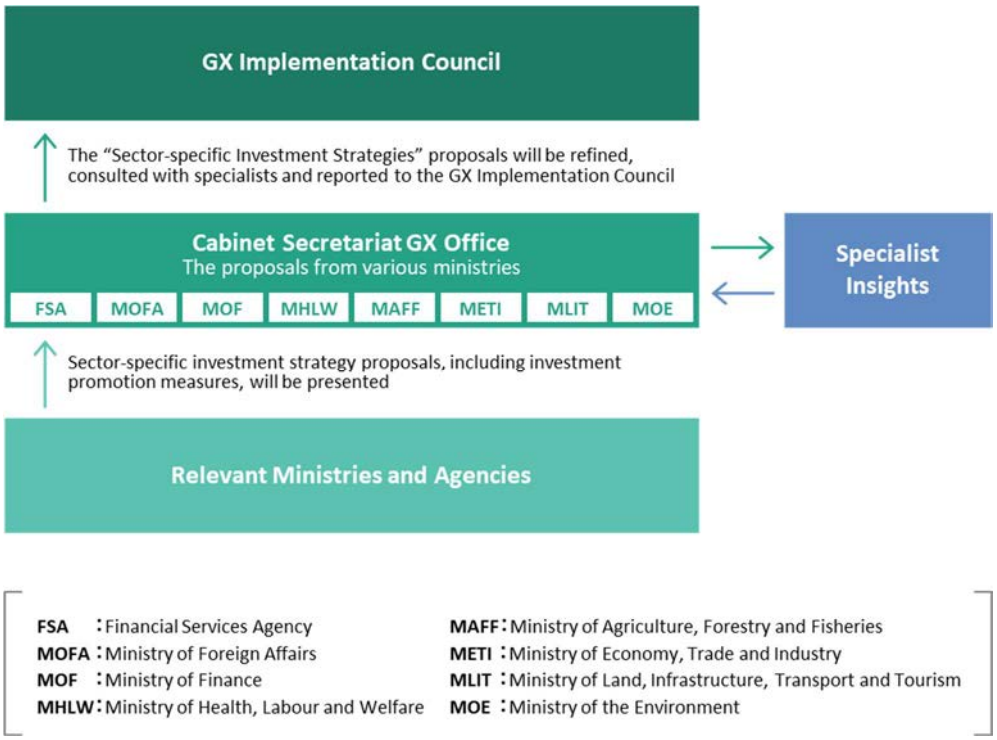


Figure 8: Governance Structure[15] .

[15] Source: this Framework

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

1-2. Alignment with Items Required in the Climate Transition Finance Handbook

Element 1. Issuer's climate transition strategy and governance

(1) Does the issuer who is financing proceeds have a transition strategy for climate change mitigation?

The Government of Japan has made clear in the Act on Promotion of Global Warming Countermeasures its aim to achieve net zero by 2050, and to implement the necessary measures to achieve this. Additionally, in the Plan for Global Warming Countermeasures revised in 2021, it has set a 2030 target, aligned with the goals agreed upon in the Paris Agreement, to reduce greenhouse gas emissions by 46% from its fiscal year FY2013 levels, and has set reduction targets for each source of emissions for FY2030 compared to FY2013. Also, in February 2025, a revision of the aforementioned Plan for Global Warming Countermeasures has conducted, setting reduction targets for FY2035 and FY2040 by 60% and 73% from its FY 2013 levels, respectively. For FY2040, reduction targets for each source of emissions has set in the same manner as for the FY 2030.

Concrete measures to achieve the realization of GX towards these aforementioned targets are outlined as the GX2040 Vision (see Table 3 above). In the GX2040 Vision, the Government of Japan is focusing on providing a longer-term direction than the existing GX promotion strategies, to enhance the foreseeability of investment towards GX amidst increasing uncertainties about future prospects. This includes policies on the GX industrial structure and GX industrial location. In addition to initiatives in individual sectors towards GX, which were already indicated in the traditional GX promotion strategies, they are formulating policies with an emphasis on industrial policy. In addition, in efforts toward GX in specific sectors, it is indicated that investment promotion measures should be advanced based on not only the "Sector-Specific Investment Strategies" but also the Plan for Global Warming Countermeasures and the 7th Strategic Energy Plan.

Therefore, it can be said that the Government of Japan has a strategy for the transition for climate change mitigation.

(2) Is the use of the "transition" label in financing intended to contribute to realizing a corporate strategy to transition to a business model that allows issuers to effectively address climate change-related risks and to contribute to achieving the goals of the Paris Agreement?

Japan's government-led GX aims to transform the economy, society, and industrial structure, which have centered on fossil fuels since the Industrial Revolution, to one focused on clean energy. It seeks to achieve a simultaneous stable energy supply, economic growth, and reduced emissions in order to reform the entire socioeconomic system.

The Japanese government intends to utilize funding raised through "transition"-labeled bonds and use these as a source for concrete support programs, thereby demonstrating to domestic businesses and citizens the significance and direction of GX.

In December 2020, immediately after the first edition of the CTFH was published by ICMA in May 2021, the Government of Japan released the "Basic Guidelines on Climate Transition Finance." This basic guideline is intended to promote efforts toward steady low-carbon energy saving in

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

sectors where emission reductions are difficult, and to accelerate innovation contributing to transitions such as long-term research and development for decarbonization. Additionally, it was formulated with the purpose of popularizing climate transition finance, which is in its nascent stage, and ensuring the credibility when raising funds under the name of transition finance. This will establish the position of transition finance as a means of funding transition, particularly in sectors where emission reductions are difficult, and contribute to realizing Japan's 2050 net zero and the goals of the Paris Agreement through the introduction of more funds.

The basic guidelines are revised in a timely manner, taking into account international movements related to transition finance, and the most recent revision was made in March 2025.

This Framework is formulated in accordance with the CTFH and the same basic guidelines, and aims to contribute to the realization of a strategy to transition to a business model that allows Japan as a whole to contribute to achieving the goals of the Paris Agreement.

(3) Is a governance system established to ensure the effectiveness of the transition strategy?

As previously mentioned, the Government of Japan recruits relevant ministries and agencies, external experts, and specialists required for GX, and after necessary discussions, the transition strategy is ultimately formulated at the GX Implementation Council chaired by the Prime Minister. Progress is then reported to this conference, where revisions are made as necessary.

Therefore, JCR evaluates that the Government of Japan is establishing a system to steadily implement its transition strategy.

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

Element 2. Business model environmental materiality

Japan ranks seventh in the world in terms of GHG emissions, and in order to keep the global temperature rise at the level set by the Paris Agreement, it is expected to take the lead in reducing them while leading the international community. Considering that the introduction of carbon pricing will begin domestically and internationally in the future, for many manufacturing industries with international competitiveness to maintain good performance while achieving a carbon-neutral society, it is urgent to implement various decarbonization measures and structural transformations for each industry type as stipulated in the GX Promotion Law. In this context, in June 2023, the Government of Japan presented the " Grand Design and Action Plan for a New Form of Capitalism," and the revised version of the above plan was issued in June 2024 and June 2025. Within this, it is anticipated that in Japan, GX (Green Transformation) will contribute to enhancing the industrial competitiveness of the country by maximizing the utilization of expertise in fields where Japanese companies have technical strengths in decarbonization-related technology research, thus accelerating the nation's transition to decarbonization.

Based on the above, JCR evaluates that the Government of Japan's efforts toward achieving carbon neutrality, known as GX initiatives, are one of the most crucial challenges for Japan.

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

Element 3. Climate transition strategy and targets to be science-based

Does the transition roadmap meet the followings?

(1) It is quantitatively measurable and the target covers Scope 1 and 2 (It is recommended that the target of Scope 3 be established to the extent feasible)

As indicated in the Plan for Global Warming Countermeasures, Japan's GHG emissions reduction target is aligned with the goal set by the scientifically based objectives agreed upon by the international community in the Paris Agreement (keeping the increase well below 2°C and limiting it to 1.5°C compared to pre-industrial levels). In Japan, since the government does not adopt the concept of Scope 1, Scope 2, and Scope 3 emissions, this section has been considered by JCR in accordance with the definitions established by the PCAF[16]. If the direct business activities of the country are defined as Scope 1 and Scope 2, the target setting and specific measures are planned in the administration and business edition. As for the emissions for the whole of Japan, which fall under Scope 3, the total emissions by source or sector are disclosed in the Plan for Global Warming Countermeasures as mentioned above. Moreover, the targets and measures for FY2030, FY2035, and FY2040 have been meticulously set based on specific technical examinations.

Therefore, JCR evaluates the Government of Japan's plan as having an appropriately covered scope, and high transparency in both disclosed achievements and targets.

(2) Alignment with generally recognized science-based target setting

Japan's GHG emissions reduction target for 2030 was set assuming alignment with the Paris Agreement in 2021. Furthermore, the sector-specific roadmaps, particularly for high-emission industries, are formulated to align as much as possible with the IEA[17]'s NZE scenario[18] and SDS scenario[19], provided there is a current or future technical basis for such alignment, with the achievement of the respective targets as a premise.

Moreover, the Government of Japan has set a target (-2.7% reduction per year *JCR conversion) that aligns with the goal of limiting global warming to 1.5°C as indicated in the IPCC[20] Special Report[21] on Global Warming of 1.5°C (approximately 45% reduction from the 2010 level by 2030; -2.25% reduction per year), which JCR evaluates as aligned with the scientifically-based goal setting under the Paris Agreement aiming for 1.5°C[22].

For reference, the relative ambition levels of targets compared to other countries are shown in the following figure.

---

[16] "Decarbonization practice guidance starting from portfolio carbon analysis for financial institutions" by Ministry of Environment, at https://www.env.go.jp/content/000125696.pdf

[17] IEA: International Energy Agency

[18] Net Zero Emissions by 2050 Scenario by IEA

[19] Sustainable Development Scenario (Sustainable Development Scenario), which is the path to fully achieve the sustainable development goals by the IEA

[20] IPCC: Intergovernmental Panel on Climate Change

[21] IPCC "Global Warming of 1.5°C An IPCC Special Report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty at https://www.ipcc.ch/site/assets/uploads/sites/2/2022/06/SR15_Full_Report_HR.pdf

[22] The IPCC's 1.5 °C Special Report was updated in the IPCC's the 6th Assessment Report (AR6) Integration Report in which the 1.5 °C is targeted to be reduced by roughly 36 – 69 per cent of CO_2 from FY 2016 by FY 2030: Reduction Rate: 3.3 – 3.6 percent per year.

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

Country	Emission Reduction Target by 2030 (Base Year 2013)
United Kingdom	-54.6%
Switerland	-49.4%
Brazil	-48.7%
Japan	**-46.0%**
United States	-45.6%
Saudi Arabia	-43.3%
EU27	-41.6%
Canada	-40.4%
South Africa	-33.3%
South Korea	-23.7%
Ukraine	-23.0%
Australia	-18.4%
Mexico	-0.4%
Thailand	7.0%
Kazakhstan	8.6%
China	14.1%
Malaysia	23.1%
Russia	51.8%
India	99.2%
Indonesia	131.0%
Pakistan	234.6%

Figure 9: GHG emission reduction rate target for FY2030 (comparison when each country's target is replaced with figures based on the 2013 standard)[23]

(3) It shall be Publicly disclosed (including Interim Targets)

The Government of Japan's goal of achieving net zero by 2050 is clearly stated in the Act on the Promotion of Global Warming Countermeasures. Additionally, interim targets have been declared in the Plan for Global Warming Countermeasures, aiming to reduce the total GHG emissions by 46% in FY2030, 60% in FY2035, and 73% in FY2040, from its FY 2013 levels. Moreover, specific targets for FY2030 and 2040, categorized by emission sources, are disclosed in the same plan, ensuring high transparency.

(4) It shall be Supported by Independent Assurance or Verification

Regarding GHG emissions, due to their unique nature, they have not received third-party certification or verification that general companies would undergo. However, given the fact that the Global Warming Prevention Headquarters , where the Prime Minister serves as chairperson and all the cabinet members participate, approves the status of the progress after the deliberation of relevant councils on an annual basis, the process is well-managed by internal and external experts. Accordingly, JCR considers that the status of the progress of the plan is virtually monitored by a third party.

[23] Materials of a joint meeting for a clean energy strategy "Materialize political initiatives for realizing GX"

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

From the above, JCR evaluates that the Government of Japan's efforts toward achieving net zero by 2050 are based on scientific evidence and meet the necessary requirements in Element 3.

Element 4. Implementation transparency

The Government of Japan, in its GX Promotion Strategy and GX2040 Vision, has decided on a total investment of 150 trillion yen by both the public and private sectors over the decade. Furthermore, the specific breakdown has been announced as follows according to the energy supply sector and the demand sector.

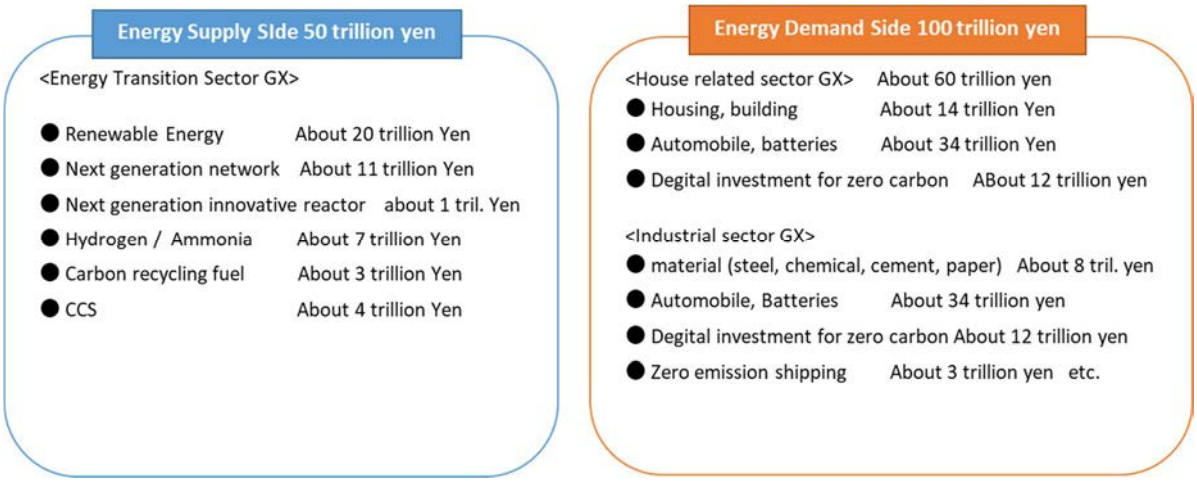


Figure 10: Breakdown of public/private investments for 10 years[24]

Out of the total investment of 150 trillion yen, 20 trillion yen is expected to be executed as an investment promotion measure through GX Economy Transition Bonds. Regarding this investment promotion measure, to enhance predictability for companies and strongly stimulate GX investment, the Government of Japan is compiling a "Sector-Specific Investment Strategies[25]" as a means to present concrete investment promotion measures and a "Five-Year Action Plan" for the next ten years in the FY 2023. Incidentally, approximately 1.6 trillion yen of Climate Transition Bonds (referred to as Government Bonds for Economic Transformation, or "CT Bonds" hereafter) have already been issued in the 2023 FY (Reiwa 5), and about 1.4 trillion yen is issued in the 2024 FY (Reiwa 6). Furthermore, at the GX Implementation Concil held in May 2024, the breakdown of the government's investment plans for the next 3-10 years as part of the main implementation status of the GX Investment Support Measures was presented as follows, and at the GX Implementation Council held in December 2024, the budget amount for each item was indicated.

[24] Sources: Materials for the GX Implementation Council: Toward the achievement of GX in Japan
[25] December 22, 2023 "Sector-specific Investment Strategies" https://www.meti.go.jp/english/press/2023/1222_002.html

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

Innovative technology development	Already allocated 1 trillion yen	・Representative examples from the Green Innovation Fund, which supports innovative technology development with high decarbonization effects: (i) Promoting development of next-generation solar cells (perovskite), to be launched on the market in 2025 (ii) Demonstration equipment for hydrogen reduction steelmaking to be introduced in 2026 (iii) Successfully developed ammonia combustion, to be commercialized in Malaysia in 2026 (MOU signed), etc. *Support for R&D of ammonia ships (plus support for production equipment for zero-emission ships, etc.) ・Support for basic research and human resource development at universities, etc. through the Green Technologies for Excellence (GteX) Program ・Support for development of semiconductor technology (photonics-electronics fusion) to drastically reduce electricity consumption, etc.
Structural transformation of high-emission industries	1.3 trillion yen or more (for 10 years)	・"Innovative electric furnaces" that cut emissions by more than half, chemical recycling, biorefineries, CCUS, etc.
Household GX	2 trillion yen or more (for 3 years)	・Renovating homes to insulated windows (strengthening the insulation of windows, which account for 70% of heat entering and leaving homes) ・Introduction of high-efficiency water heaters (heat pumps, etc.) ・Support for the introduction of electric vehicles/storage batteries, etc.
Hydrogen, etc.	3 trillion yen or more (for 15 years)	・Support measures focusing on the price difference of hydrogen, etc.
Next-generation renewable energy	1 trillion yen or more (for 10 years)	In addition to renewable energy introduction support measures (FIT system) on the scale of several trillion yen per year, ・Support for building supply chains for perovskite, floating offshore wind, water electrolysis equipment, etc., and consideration of support for the introduction of perovskite (in addition to the GI fund, 1 trillion yen will be provided over 10 years)
Small and medium-sized enterprises, startups, etc.	1 trillion yen or more (for 3-5 years)	・Support for energy conservation for small and medium-sized enterprises, etc. (700 billion yen will be provided over 3 years) ・Support for GX startups (200 billion yen will be provided over 5 years) etc.
Tax measures		- Establish new tax credits based on the production and sales volume of green steel, green chemicals, SAF, EVs, etc.

Figure 11: Implementation status of GX investment support measures[26]

Regarding the investment details for each fiscal years, as the government's budget is executed on an annual basis, they plan to announce it after the annual budget is passed.

Based on the above, JCR evaluates the Government of Japan's investment plan as having high transparency, as the government discloses information such as planned government expenditures, the scale of public-private investment expected to be promoted by these expenditures, and the 10-year roadmap.

[26] Translated by JCR based on "Toward accelerating Japan's green transformation" (May 13, 2024) submitted to GX promotion council.
https://www.cas.go.jp/jp/seisaku/gx_jikkou_kaigi/dai11/siryou1.pdf

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

The Ministry of Economy, Trade and Industry in Japan has pointed out in its sector-specific roadmap that there are multiple areas requiring business transformation and employment shifts that accompany the execution of transition strategies. Since most of the expenditures from GX Economy Transition Bonds are directed towards research and development or grant programs for multiple companies, they do not inherently require the direct consideration of a just transition as business transition strategies do. On the other hand, the Government of Japan recognizes that achieving a fair transition is an important issue, considering Japan's characteristics of having a high proportion of manufacturing industries and low labor mobility. Based on the above, the GX2040 Vision includes additions regarding a "just transition," detailing support for the facilitation of labor mobility to growth sectors, transfer support, and reskilling assistance for career upgrades of current employees. It also describes efforts to support the acquisition of new skills necessary to respond to the advancement of supply chains through the use of DX such as robotics and AI, taking into account ensuring that workers can continue to thrive in an advanced supply chain as the transition to a GX industrial structure occurs.

Regarding the possibility of being locked into fossil fuels, both the sector-specific roadmap and the GX2040 Vision formulated by the Government of Japan are designed to achieve net zero by 2050. They are aimed at achieving carbon neutrality through next-generation technological innovation rather than relying heavily on carbon credits, thus assessing the risk as low. In addition, it is a prerequisite that the target projects for the support measures funded by these bonds are aligned with Japan's transition strategy, such as sector-specific technology roadmaps, and it is evaluated that the risk of locking in fossil fuels is low.

Regarding the perspective of DNSH (Do No Significant Harm), it is considered that the significant use of this Framework's funds allocated towards research and development, and the establishment of clear criteria in the grant program for benchmarking subsidies, work to avoid serious negative impacts on the environment.

Accordingly, JCR has evaluated that this Framework satisfies the four elements required in the Climate Transition Finance Handbook.

Based on the above, JCR evaluates that the modified eligibility criteria also target properties that are expected to have a high environmental improvement effect.

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

2. The Use of Proceeds

The Government of Japan has defined the use of procured funds under this Framework as follows (sections in bold and underlined indicate the recent changes). The following lists only the modified framework.

The Framework for Use of Proceeds

3.1.2 Climate Transition Bonds: Classification of the use of proceeds (eligible projects)

Table 3 is the classification table of main eligible use of proceeds (eligible projects) that meet the "basic conditions".

The use of proceeds are the key economic activities that are currently being organized among the government-led initiatives towards achieving **Japan's GHG Emissions Reduction Targets**. These activities are expected to be updated with the progress of GX-related initiatives, etc., in the future. The use of proceeds is broadly classified into six green categories and each category is further classified based on the eligibility criteria.

Table-3 Climate Transition Bond: Classification of the use of proceeds

Main Category (Green category)		Sub-category Eligibility criteria	Typical use of proceeds (eligible projects)
1	Energy efficiency	Promotion of thorough energy efficiency improvement	Promote the spread of energy-efficient appliances
		Houses and buildings	Support for building new houses and buildings with high energy efficiency and retrofitting to improve energy efficiency Replacing windows with thermal insulated models with higher energy efficiency
		Digital investment aimed at decarbonization	Facilitating the development of and investment in energy efficient semiconductors, photonics electronics convergence technologies, etc.
		Battery industry	Investments in plants manufacturing batteries together with their material and components
2	Renewable energy	Making renewable energy a major power source	Floating offshore wind Next-generation solar cells (perovskite)
		Infrastructure	Development of cities and communities contributing to decarbonization
3	Low-carbon and decarbonized energy	Utilization of nuclear power	Next-generation advanced reactors with built-in new safety mechanisms
		Establishing electricity and gas markets to achieve carbon neutrality	Promoting zero-emission thermal power Development of submarine DC transmission systems, etc.
4	Clean transportation	GX in transport sector	Support for the introduction of next-generation vehicles Developing demonstration aircraft by 2030s and spreading the use of zero-emissions ships, etc.
		Infrastructure (repeat)	Development of cities and communities contributing to decarbonization

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

5	Circular economy adapted products, production technologies and processes	Restructuring the manufacturing industry (fuel and feedstocks transition)	Development and introduction of innovative technologies such as hydrogen reduction steelmaking Conversion to Carbon-Recycling production systems
		Facilitating introduction of hydrogen and ammonia	Building supply chain both domestically and internationally Research and development as well as the introduction support of production and usage of hydrogen derived from excess renewable energy sources
		Carbon Recycling and CCS	Support for research and development of Carbon Recycling fuel
6	Environmentally sustainable management of living natural resources and land use, Circular economy	Food, agriculture, forestry, and fisheries industry	Decarbonization of agriculture, forestry and fisheries
		Resource circulation	Investment to accelerate resource circulation of plastics, metals, sustainable aviation fuel (SAF), etc.

JCR's Evaluation for the Framework

Taking into account the concretization of efforts in each field, the Government of Japan has added eligible project examples in the areas of energy efficiency, low-carbon and decarbonized energy, clean transportation, environmentally friendly products, and production technologies and processes in this Framework. Furthermore, in the field of low-carbon and decarbonized energy, support for long-term and large-scale continuous investments by electricity providers in newly included renewable energy and nuclear power generation has been added to the list of funding purposes. Additionally, related major policy roadmaps (which had described based on the Basic Policy for the Realization of GX (Future milestone)) across all funding purposes have been revised into the Sector-specific investment roadmap (based on the Sector-specific Investment Strategies). The JCR's evaluation of these changes is shown below.

1. Environmental improvement effects of the project

(1) Green category: Energy efficiency

No.1.1 Promotion of thorough energy efficiency improvement

This Framework on the Use of Proceeds

1) Green Category: Energy Efficiency

Table 4.1: Energy efficiency "Promotion of thorough energy efficiency improvement" "Housing and buildings" "Digital investment aimed at decarbonization" "Battery industry"

Green Category: Energy Efficiency
No.1.1 Promotion of thorough energy efficiency improvement
Support will be provided for the necessary environmental improvements (related measures, development of related facilities and systems) to achieve a 62 million kl energy efficiency improvement by FY 2030 compared to FY 2013 levels.

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

＜Related key **sector-specific investment roadmaps**, technology roadmaps＞
Sector-Specific Investment Roadmaps: Life-related Industry, Steel, Chemicals, Cement, Paper and Pulp
Technology roadmaps: Iron and Steel sector, Chemical sector, Paper and Pulp sector, Cement sector

＜Examples of initiatives (overview, etc.)＞

- Support program for promoting energy efficiency in the household sector through the introduction of high-efficiency water heaters
  - Support for the installation of facilities related to efforts to promote the adoption of high-efficiency water heaters by consumers and others
  - Criteria example: The heat pump water heater exceeds the 2025 target (energy consumption efficiency: 3.5 or higher, etc.) set by the Top Runner Program under the Act on Rationalizing Energy Use, etc.

- Support program for promoting energy-efficiency investments and transitioning demand structures
  - Support for energy-efficiency investments such as upgrading to advanced energy-saving facilities with high technical capabilities and energy efficiency, which have the potential for future expansion of adoption
  - Criteria example:
    In the case of upgrading to advanced facilities and systems, one of the following criteria should be met as a whole of factory and business premises.
    Energy efficiency rate + increase rate of non-fossil fuel proportion: 30% or higher,
    Energy saving volume + non-fossil fuel usage volume: 1,000 kl or higher,
    Improvement rate of energy consumption per unit: 15% or higher, etc.
    In the case of upgrading in a customized manner to fit the usage purposes of the business entity, one of the following criteria should be met as a whole of factory and business premises.
    Energy efficiency rate + increase rate of non-fossil fuel proportion: 10% or higher,
    Energy saving volume + non-fossil fuel usage volume: 700 kl or higher,
    Improvement rate of energy consumption per unit: 7% or higher, etc.

- **Support for installing CO_2-saving facilities to reduce Scope 3 emissions through collaboration among companies**
  Support for installation of CO_2-saving facilities to companies and their value chain (mainly medium and small size enterprises), taking into account the importance of reducing CO_2 emissions from the value chain (Scope 3) is increasing mainly in large companies.

The use of proceeds No. 1.1 remains unchanged from the previous evaluation, focusing on support for the installation of energy-saving measures in the industrial sector[27], business sector[28] and household sector[29]. This time, the Government of Japan added the " Support for installing CO_2-saving facilities to reduce Scope 3 emissions through collaboration among companies" to the examples of business applications for these funds.

The project added as an eligible business example involves multiple companies collaborating to support the introduction of energy-saving CO_2 equipment, specifically those expected to have over a 30% CO_2 reduction effect compared to current equipment. The aim is to promote CO_2 emission reduction throughout the entire value chain by reducing Scope 3 emissions (CO_2 emissions of other companies related to corporate activities). This project has been adopted as an initial budget project for FY 2025 (Reiwa 7) (an initiative under the Ministry of the Environment). JCR has assessed that the quantitative CO_2 reduction effect is clearly

[27]Energy consumption in the manufacturing, agriculture, forestry, fisheries, mining and construction industries.
[28]Energy consumption in tertiary industries, such as hotels, department stores and service industries or offices/buildings in corporate management divisions, (excluding transportation-related businesses and energy conversion businesses)
[29]Energy consumption at home, such as cooling, heating, hot water supply, kitchen, power/lighting (excluding transportation, including private automobiles)

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

demonstrated to investors, and targets facilities contributing to the reduction of energy usage by companies working on climate change mitigation.

Additionally, the unique feature of this project is that rather than simply aiming to reduce Scope 3 emissions, it focuses on achieving decarbonization across the entire value chain through the collaboration between SMEs, which tend to lag behind large companies in decarbonization efforts, and major corporations. In general, small and medium-sized enterprises tend to lag behind large corporations in efforts toward decarbonization due to a lack of human and capital resources. On the other hand, emissions from small and medium businesses account for a little less than 10-20% of Japan's total greenhouse gas emissions[30]. Therefore, efforts by these smaller enterprises are also indispensable for realizing carbon neutrality. Based on this background, JCR evaluates the significance of the projects in which major companies collaborate with multiple small and medium enterprises that make up the value chain to promote the investment in CO_2-saving equipment that contributes to the reduction of Scope 3.

Thus, JCR assesses that the projects recently added as examples of this Framework support the promotion of energy saving and are consistent with the energy-saving policies set by the Government of Japan for achieving the NDC.

[30] Guideline for Initiatives to Reduce Greenhouse Gas Emissions, etc. ~For Small and Medium Enterprises~ Introductory Practical Guidebook for Carbon Neutrality" March 2023 (Updated in part March 2025) Ministry of the Environment, Global Environment Bureau, Global Warming Countermeasure Division, Global Warming Countermeasure Project Office

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

No.1.2 Houses and Buildings

This Framework on the Use of Proceeds

1) Green category: Energy efficiency

Table 4.1: Energy efficiency "Promotion of thorough energy efficiency improvement" "Housing and buildings" "Digital investment aimed at decarbonization" "Battery industry"

No.1.2 Housing and buildings
To achieve the fundamental energy efficiency improvement of houses and buildings (e.g., ensuring energy-saving performance at the ZEH[31] and ZEB[32] level for new houses and buildings by 2030), the expansion and strengthening of regulations through Building Energy Efficiency Act, **and other measures such as energy-saving renovations of existing housing and buildings will be implemented over years**. ＜Related key **sector-specific investment roadmaps**, technology roadmaps＞ **Sector-specific Investment roadmaps:　Life-related Industry**
＜Examples of initiatives (overview, etc.)＞ ● Support program for accelerating energy efficiency and CO_2 reduction in the household sector through the promotion of retrofitting to insulated windows, etc. ➢ Support for immediate and effective renovation through retrofitting to insulated windows to enhance thermal performance of existing residential buildings. ➢ Criteria example: Heat transfer coefficient (Uw value) of 1.9 or lower, surpassing the 2030 target level of the Top Runner Programme for building materials, etc.

JCR evaluated the use of this proceed as appropriate at the time of the last assessment. In JCR, the change made in the current revised framework is the revision from "Policy roadmaps (based on the Basic Policy for the Realization of GX)" to "Sector-specific Investment Roadmaps (based on the Sector-specific Investment Strategies)" regarding the "Related Key Policy Roadmaps." In addition, it clearly restates the past policy implementations regarding existing housing and buildings. Based on the above, since it is updated in terms of content, it continues to be evaluated as appropriate.

No.1.3 Digital investment aimed at decarbonization

This Framework on the Use of Proceeds

1) Green category: Energy efficiency

Table 4.1: Energy efficiency "Promotion of thorough energy efficiency improvement" "Housing and buildings" "Digital investment aimed at decarbonization" "Battery industry"

No.1.3 Digital investment aimed at decarbonization
To drive growth in the semiconductor industry, continuous investment in semiconductor and related supply chains towards achieving GX will be implemented throughout the 2030s. This includes advancing the societal implementation of future technologies such as next-generation semiconductors and optoelectronic fusion. **Furthermore, as the acceleration of DX (digital transformation) utilizing AI can maximize the impact of GX, carbon neutrality of data centers will be promoted by leveraging these technologies to develop the necessary domestic data centers.** ＜Related key **sector-specific investment roadmaps)**, technology roadmaps＞ **Sector-specific Investment roadmaps:　Batteries, Semiconductors**

[31] The abbreviation for Net Zero Energy House
[32] The abbreviation for Net Zero Energy Building

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

＜Examples of initiatives (overview, etc.)＞

- Support programs for strengthening the semiconductor supply chain to achieve GX through improved power performance
  - Achieving overall improvement in competitiveness of Japan's power semiconductors and solving societal challenges such as decarbonization through strengthening the semiconductor supply chain that contributes to energy efficiency enhancement
  - Criteria Example: The investment should be of a substantial scale (in principle, exceeding 200 billion yen) with a focus on SiC power semiconductors. The performance of equipment and devices to be introduced should be advanced.

- Research and development projects for future technologies that are essential for achieving GX, such as optoelectronic fusion
  - Pursuing the development of important technologies to realize high-performance and energy-efficient computing infrastructure with high-speed and low-loss.
  - Criteria Example: The performance indicator of semiconductor devices with optoelectronic fusion devices implemented in the package, expressed as bandwidth density/power (Gbps/mm)/(pJ/bit), should be 800 times or more compared to the products currently available at the start of the research and development

- **Research and Development of AI foundation models and advanced semiconductor technologies and related projects**
  - **R&D support for information networks and their parts (calculation resources, AI foundation models, etc.)**
- **Research and Development Program for Next-generation Edge AI Semiconductor**
  - **R&D support for academic research to be bridged to industries speedily, for technologies regarding existing industries or those backcasted from new industries needed after the mid-2030s, regarding the design, manufacturing, and materials of innovative next-generation edge semiconductors with extremely low power usage.**

Use of proceeds No. 1.3 has remained unchanged since the last assessment and pertains to support for research and development as well as equipment installation in the digital sector to significantly improve energy efficiency. Recently, the Government of Japan has specified the description of this funding purpose and added business examples such as the "Research and Development of AI foundation models and advanced semiconductor technologies and related projects" and the "Research and Development Program for Next-generation Edge AI Semiconductor."

To achieve net zero by 2050, electrification across various sectors through the maximum introduction of renewable energy is planned. Additionally, due to the expected increase in electricity demand related to IT and communications, driven by the promotion of digital transformation (DX), innovation to improve energy efficiency is essential in each field. In the GX2040 vision, it is mentioned that the acceleration of DX through the utilization of AI, such as the optimization of supply and demand of renewable energy using AI, and the development of efficient new materials with high CO_2 reduction effects, holds the potential to maximize the effect of GX, which aims to simultaneously achieve growth and decarbonization. The Government of Japan aims to accelerate growth and simultaneously solve social issues through the dual approach of GX and DX. Based on such background, the Government of Japan has specified subsidy programs or research and development costs aimed at dramatically improving energy efficiency in various industries such as the material industry, semiconductor industry, and data communication industry in Japan, by investing in digital investment technologies. This has

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

materialized the initial statement mentioned earlier. JCR evaluates that the changes in this statement clarify the Government of Japan's policies and deem them appropriate.

Semiconductors are cited as indispensable strategic materials for promoting DX (Digital Transformation) and GX (Green Transformation). Below is the classification of semiconductor products based on WSTS (WORLD SEMICONDUCTOR TRADE STATISTICS: World's Semiconductor Market Statistics). Semiconductor products are broadly divided into IC (Integrated Circuits), which are composed of multiple elements, and others. The IC (Integrated Circuit) includes components such as micro, logic, and memory, which play the role of the "brain" in humans, as well as analog semiconductors, which correspond to sensory organs. On the other hand, semiconductors outside of ICs have a wide variety of functions; optoelectronics such as LEDs and optical fibers, which convert light and electricity, and sensors that detect physical and chemical properties, are specifically categorized separately as they have become increasingly widespread.

Incidentally, power semiconductors that perform various power conversions through switching operations are classified as discrete according to the WSTS classification, though in recent times, integrated ICs of these have also been referred to as "power semiconductors." Power semiconductors are often compared to "muscles" in humans, playing a role in efficiently utilizing power. Specifically, the roles include the conversion of electric current flow (an inverter that changes DC to AC, a converter that changes AC to DC), frequency conversion, and voltage conversion (regulator).

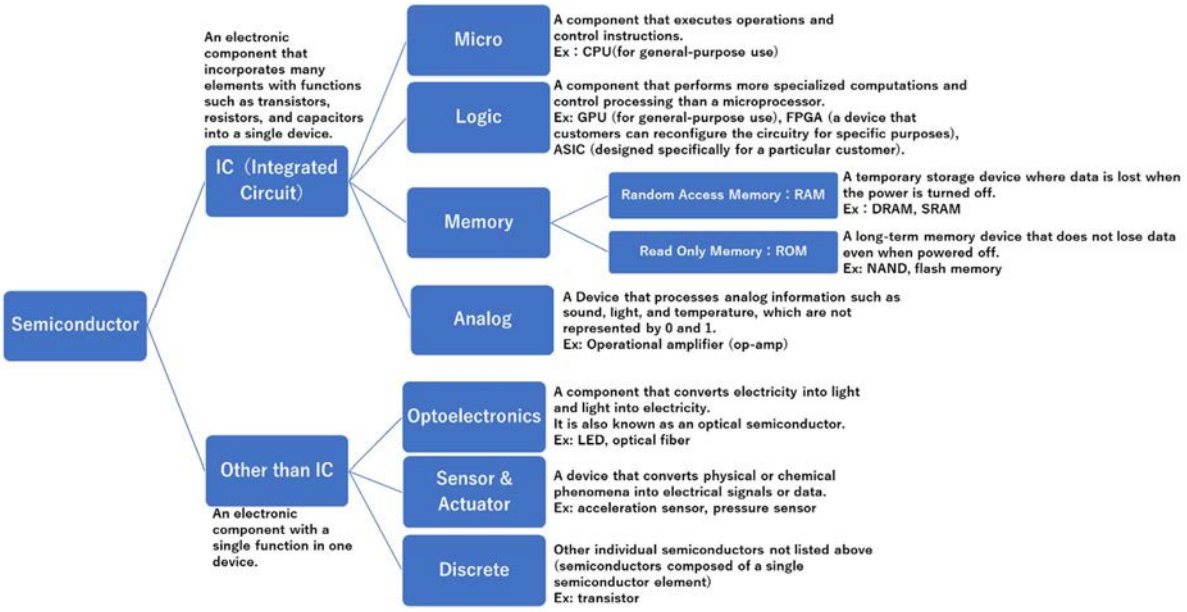


Figure 12: Classification of Semiconductor Products1[33]

With the proliferation and advancement of AI, changes are occurring not only in the performance enhancement of each product but also in the design philosophy of semiconductor products. For example, SoCs (System on a chip), which further integrate components of integrated circuits onto a single chip, have been used, but a chiplet integration design method has also emerged, where the chips are manufactured separately and then combined. Furthermore, it is anticipated that not only AI learning in data centers, but also AI applications such as inference will rapidly

[33]JCR compiled from WSTS and various public materials.

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

progress in edge devices, which are used by consumers such as home appliances, smartphones, cameras, and automobiles. Therefore, while a variety of general-purpose semiconductors have been used in different applications so far, it is said that developing dedicated semiconductors tailored to specific applications is crucial for achieving high performance and low power consumption.

Based on this background, the Government of Japan has recently added two projects to the list of business examples eligible for these funds.

(i) Below are the details: Research and Development of AI foundation models and advanced semiconductor technologies and related projects.

This use of proceed is designated as a GX development theme within the "Post-5G Information Communication System Infrastructure Enhancement R&D Project Development Plan." In this R&D plan, cross-cutting research and development are planned, not only focusing on the R&D specific to each product but also technology that links different products. For specifics, refer to Table 3.

Table 3: Post-5G Information Communication System Infrastructure Enhancement R&D Project (GX)3[34]

	Development goals related to GX	JCR's Analysis and Evaluation
Development of photonic-electronic fusion implementation technology and computing infrastructure technology with fixed delay Photonics Chiplet Implementation Technology	By applying photonics chiplet implementation technology, the power per unit of communication volume of the semiconductor device developed must be reduced by more than 40% compared to equivalent technology or products that are widespread at the start of research and development.	Photonic-electronic fusion technology is a technology that combines circuits handling electrical signals with circuits handling optical signals. Traditional computers have executed calculations using "binary numbers" by switching the electricity on and off. However, as electricity flows through circuits, it generates heat, which leads to energy being used for unnecessary heat production. Furthermore, when heat is generated, the resistance in the electrical pathway increases, resulting in a decrease in calculation speed. Therefore, research is being conducted to replace computations that were previously done electrically with processing that uses light. Connecting the internal circuits of a computer with light instead of electricity as much as possible enables power-efficient transmission. Furthermore, in this project, it is expected that through the
Development of implementation technologies associated with optoelectronic integration and fixed-delay computing infrastructure technology. Optoelectronic integrated interface memory module technology.	The power consumption should be reduced by more than 30% compared to equivalent technologies or products that are widespread at the start of the research and development.	

[34]Created JCR by Post-5G Information and Communication System Infrastructure Strengthening Research and Development Project Research and Development Plan (March 25, 2025)
https://www.meti.go.jp/policy/mono_info_service/joho/post5g/pdf/20250325_kenkyukaihatsukeikaku.pdf)

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

		integration of optical and electronic technologies, there will be a quantitative reduction in power consumption compared to conventional products, offering environmental improvement benefits.
Optoelectronic fusion-related implementation technology and development of a deterministic delay computing infrastructure technology Deterministic delay computing infrastructure technology	The proposer must set specific use cases and target values, including power reduction, at the time of the proposal	By using photoelectric fusion technology, information is transmitted at the wavelength unit of light, eliminating the need for synchronization processing and data compression. Furthermore, traditionally, buffers were necessary to cover communication delays due to unpredictable latency lengths, but because transmission occurs at the wavelength unit, the latency time can be determined, making buffers unnecessary. As a result, low-latency data transmission has become possible, and it is expected to play an active role in fields requiring real-time information, such as remote surgery. At present, there are no specific power-saving targets set for this project, but it is planned that the proposer will set them in the future. This project involves development in collaboration with the optical chiclet implementation technology and the photonic-electronic fusion interface memory module technology mentioned above.
By leveraging photonic-electronic fusion technology, there is a high probability that the overall power consumption of the system will be reduced. Development of manufacturing technologies for next-generation wideband, low-power HBM	Reduction ratio of power consumption per transmission volume: 30% or more compared to products at the start of research and development	HBM (High Bandwidth Memory) is a type of DRAM with very high bandwidth (data transfer speed). By vertically stacking multiple DRAM chips and connecting them with a silicon substrate, it achieves high-speed data communication and low latency. Compared to conventional products, a quantitative reduction in power consumption is expected, offering environmental improvement effects.
Innovation in memory manufacturing technology development Power consumption: an average reduction of more than 10% in power consumption per bit compared to DRAM.		Develop manufacturing technology for innovative memory with properties intermediate between DRAM and NAND. In other words, the aim is to develop memory that can store a moderate amount of data with low power consumption, allowing data to be preserved for

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

		extended periods of time without needing to access ROM specifically. Therefore, when comparing simple memory alone, the reduction rate in power consumption is small at 10%, but by aiming for overall optimization, it is expected that the power consumption effect across the entire architecture will be high.
Development of AI memory design and manufacturing technology for edge	・In cases where peak bandwidth at edge terminals is prioritized, energy efficiency (pJ/bit) during data transfer between the processor and memory should be improved by more than 15 times - In cases where memory on edge devices prioritizes consistent bandwidth, the energy efficiency of memory (pJ/Byte) is improved by 40%.	Edge-oriented AI (or Edge AI) refers to AI that is directly integrated into network terminal devices (edge devices), characterized by the constraints on power supply. Therefore, semiconductor products equipped for edge AI are generally required to be energy-efficient and capable of handling large volumes of data. In this project, development will be particularly focused on memory. Since the edge domain has a wide range of applications from mobile devices to automobiles, two cases are considered. In either case, a quantitative reduction in power consumption is expected, thus providing an environmental improvement effect.
Development of communication AI semiconductor design technology	The AI processing performance/power consumption is more than five times compared to the semiconductors currently in general use.	Traditionally, generic CPUs and GPUs, which can be used for any product, provided differentiation through software according to the application. However, to achieve a balance between performance and power consumption, it is expected that the combination of application-specific optimized dedicated semiconductors and specialized software will become mainstream in the future. This project involves technology development related to the design of AI semiconductor chips specialized for communication devices. By specializing them, it is expected to quantitatively reduce power consumption per AI processing performance compared to conventional general-purpose semiconductors, thus having an environmental improvement effect.
Technology development toward the construction of a chiplet design platform		They are aiming to develop a chiplet-type custom SoC design platform that includes SoC chiplets,

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

Development of element chips and implementation technology toward the construction of a platform -		FPGA chiplets, basic circuits for dedicated chiplets, and more, rather than high-performance semiconductor products (an operating environment for common infrastructure technology and the like). As mentioned above, due to the spread of AI, there is a movement to shift from general-purpose semiconductors to application-optimized dedicated semiconductors. Based on this, each company aims to establish a platform to efficiently design dedicated semiconductors. Therefore, it is not possible to set power-saving goals for the final semiconductor products. However, by utilizing the platform developed through this project, it is expected that, after the project's conclusion, private companies will be able to launch products utilizing specialized semiconductors instead of conventional general-purpose semiconductors, thereby achieving low power consumption.
In-vehicle Semiconductor Inter-data Transmission Technology:	Power consumption for transmission: Compared with current electrical wiring, a reduction of over 70% at a distance of 0.3m or more between in-vehicle semiconductors.	As the electrification and autonomous driving of automobiles advance, we are aiming to develop technology that transmits data between in-vehicle semiconductors with low power consumption, at high speed, while maintaining reliability. Compared to conventional electrical wiring, a quantitative reduction in power consumption related to data transmission is anticipated, resulting in environmental improvement effects.

Each of these themes aims for societal implementation (TRL7-8) in the early 2030s.

(ii) Research and Development Program for Next-generation Edge AI Semiconductor

This project aims to contribute to the realization of innovative next-generation edge AI semiconductors with ultra-low power consumption, which were traditionally difficult to achieve, by utilizing the seeds of academia. In recent years, with the rapid increase in data processing volume, the surge in power consumption on the cloud side has become a major issue, necessitating a dramatic improvement in the performance of AI semiconductors capable of advanced information processing on the edge side. This involves conducting research and development that academia should undertake concerning innovative next-generation edge AI

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

semiconductor technologies, such as ultra-low power consumption design, manufacturing, and materials. This research aims to connect existing industries or the new industries required from the mid-2030s onwards by backcasting, with a focus on rapid technology transfer to the industrial sector. The plan is to integrally promote research and development of high-efficiency system designs, ultra-low power AI circuits, new materials, devices, processes, and integration technologies for chips beyond the 1-nanometer generation, and manufacturing technologies with low environmental impact. Specific themes will be finalized through mutual cooperation between the Ministry of Economy, Trade and Industry and the Ministry of Education, Culture, Sports, Science and Technology during FY2025. Depending on the research and development themes, we intend to estimate the target energy usage reduction effects.[35]

Compared to (i), the focus is on research closer to basic research, with plans to reach about TRL 5 in the early 2030s. However, the aim is to seamlessly bridge the gap to the phase where private companies move into development in the future, and although the TRL level of this project alone is low, it is expected to have a high contribution to future technological development.

Based on the above, JCR has evaluated that the projects added as examples in this Framework are initiatives to improve the energy efficiency of various industries using next-generation digital technology.

No.1.4 Battery industry

This Framework on the Use of Proceeds

1) Green category: Energy efficiency

Table 4.1 Energy efficiency "Promotion of thorough energy efficiency improvement" "Housing and buildings" "Digital investment aimed at decarbonization" "Battery industry"

No.1.4 Battery industry
To achieve the goal of establishing a domestic manufacturing infrastructure for batteries with a capacity of 150GWh by 2030, intensive investments **and support for research and development for technologies** in battery production facilities will be implemented over 5 years while creating demand by approaching demand side through the Act on Rationalizing Energy Use over the next decade. ＜Related key **sector-specific investment roadmaps**, technology roadmaps＞ **Sector-specific investment roadmaps: Batteries**
<Examples of initiatives (overview, etc.)> ● Supporting initiatives for strengthening the manufacturing supply chain of batteries which are essential for a green society ➢ To ensure the prompt and stable supply of batteries that are essential for maintaining the infrastructure of electrification and digitalization society, enhancement of the domestic manufacturing infrastructure will be implemented by supporting capital investment and technology development in batteries and component materials

[35]Even higher performance semiconductors beyond the 1nm generation. To increase the integration density of semiconductors, technology development to miniaturize semiconductors and reduce element size is required; hence semiconductor technology generations are generally expressed in nm. In the roadmap presented by Tokyo Electron at IEDM 2023, starting mass production of 20,000 wafers per month is planned, with 2nm in 2024-2025, 14Å (1.4nm) in 2027-2028, 10Å (1nm) in 2029, 7Å (0.7nm) in 2031, 5Å (0.5nm) in 2033, and 3Å (0.3nm) in 2035.

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

➢ Criteria example: Expansion of production capacity should be as follows At least 3GWh per year (for automotive batteries) At least 300MWh per year (for stationary batteries)

At the time of the previous evaluation, JCR assessed the use of these proceeds as appropriate. In this updated framework, JCR has identified changes that revise from "Policy roadmaps (based on the Basic Policy for the Realization of GX)" to "Sector-specific Investment Roadmaps (based on the Sector-specific Investment Strategies)" regarding the "Related Key Policy Roadmaps," and the clear restatement of the support content. They are deemed to be a content update; therefore, it continues to be evaluated as appropriate.

(2) Use of proceeds 2: Renewable energy

No.2.1 Making renewable energy a major power source

This Framework on the Use of Proceeds

2) Green category: Renewable energy

Table 4.2 Renewable energy "Making renewable energy a major power source" "Infrastructure"

Green Category: Renewable Energy
No.2.1 Making renewable energy a major power source
Toward the maximum introduction of renewable energy, Japan aims to achieve the social implementation of next-generation renewable energy technologies such as the establishment of a domestic mass production system for next-generation solar power and the formation of large-scale offshore wind power projects including floating offshore wind turbines over 10 years. ＜Related key **sector-specific investment roadmaps**, technology roadmaps＞ **Sector-specific investment roadmaps: Next-Generation Renewable Energy, Life-related Industry** Technology roadmaps: Power sector
＜Examples of initiatives (overview, etc.)＞ ● Development and demonstration projects for cost reduction in offshore wind power generation ➢ Development of element technologies for wind turbines and floating platforms tailored to the weather and sea conditions in Asia. Involvement of users (power generation companies) in the integrated design and demonstration of wind turbines, floating platforms, cables, etc. ➢ Criteria example: Projected level of 8-9 yen/kWh for the electricity generation cost of bottom-mounted offshore wind turbine under specific conditions (such as wind conditions) by 2030, etc. ● Development and demonstration projects for next-generation solar cells ➢ Development of next-generation solar cells (perovskite solar cells, etc.) that can be installed on building walls and other surfaces ➢ Criteria example: Projected electricity generation cost of 14 yen/kWh or lower under specific conditions (such as sunlight conditions) by the FY 2030

In the previous evaluation, JCR assessed this use of proceeds as appropriate. In the JCR, the changes in this revised framework refer to the update of the “Related Key Policy Roadmaps” from "Policy roadmaps (based on the Basic Policy for the Realization of GX)" to "Sector-specific Investment Roadmaps (based on the Sector-specific Investment Strategies)," and since it only involves updating the content, it continues to be assessed as appropriate.

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

No.2.2 Infrastructure

This Framework on the Use of Proceeds

2) Green category: Renewable energy

Table 4.2: Renewable energy "Making renewable energy a major power source" "Infrastructure"

Green Category: Renewable Energy
No.2.2 Infrastructure
Promotion of the formation of Carbon Neutral Ports (CNPs) and decarbonization in construction work to achieve decarbonization and enhance competitiveness in industries and ports. Promotion of renewable energy introduction and thorough energy consumption reduction by utilizing various infrastructures such as airports, roads, dams and sewage systems. Advancing the development of cities and regions that contribute to decarbonization ＜Related key **sector-specific investment roadmaps**, technology roadmaps＞ **Sector-specific investment roadmaps: Life-related Industry**
＜Examples of initiatives (overview, etc.)＞ ● Support program for the construction of self-owned microgrids ➢ Supporting the introduction of key decarbonization products and technologies (renewable energy, energy efficiency, energy storage), etc., with high GHG emission reduction effects into self-owned microgrids in specific regions where private businesses benefit from self-owned microgrids through public-private collaboration ➢ Criteria example: In the areas where include self-owned microgrids, establishing a plan to achieve substantial zero emissions from the household and business sectors within the target region by FY 2030

In the previous evaluation, JCR assessed this use of proceeds as appropriate. In the JCR, the changes in this revised framework refer to the update of the "Related Key Policy Roadmaps" from "Policy roadmaps (based on the Basic Policy for the Realization of GX)" to "Sector-specific Investment Roadmaps (based on the Sector-specific Investment Strategies)," and since it only involves updating the content, it continues to be assessed as appropriate.

(3) Use of proceeds 3: Low-carbon and decarbonized energy

No. 3.1 Utilization of nuclear power

This Framework on the Use of Proceeds

3) Green category: Low-carbon and decarbonized energy

Table 4.3: Low-carbon and decarbonized energy "Utilization of nuclear power" "Establishing electricity and gas markets to achieve carbon neutrality"

Green category: Low-carbon and decarbonized energy
No. 3.1 Utilization of nuclear power
Developing and constructing next-generation innovative reactors that incorporate new safety mechanisms, with the utmost priority on ensuring safety. ＜Related key **sector-specific investment roadmaps**, technology roadmaps＞ **Sector-specific investment roadmaps: Nuclear Power** Technology roadmaps: Power sector
< Examples of initiatives (overview, etc.)> ● **Support for R&D and Building Supply Chains for the Development and Construction of Next-Generation Reactors** ➢ **Support for R&D of next-generation reactors, and maintaining/strengthening domestic industry basis**

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

- Project for the development of fast reactor demonstration
  - Based on the revised “Strategic Roadmap” for fast reactor development, which was updated on December 23rd 2022, the specifications for the reactor concept and the core companies to be selected for the conceptual design from FY 2024 onwards
- Project for the development of high-temperature gas reactor demonstration
  - Feasibility study of carbon free hydrogen production method using high temperature above 800°C. Establishment of connection technologies and evaluation methods to achieve high safety using decarbonized high-temperature heat source above 800°C and hydrogen production technology through commercialized methane steam reforming method.
  - Criteria example: With the aim of supplying a large amount of hydrogen stably at approximately 12 yen/Nm3 by 2050 using decarbonized high-temperature heat above 800°C and carbon-free hydrogen production methods, efforts will be made for industrial applications such as iron and steel production and chemical industries.

Fund use No.3.1 remains unchanged from the previous evaluation and is designated for research and development funds for next-generation innovative reactors. Recently, the Government of Japan added a business example to this use of proceed, namely "Support for R&D and Building Supply Chains for the Development and Construction of Next-Generation Reactors."

"Utilization of nuclear power" is cited as one of the "decarbonization initiatives for GX, premised on ensuring stable energy supply" in the "Basic Policy for Achieving GX – A Roadmap for the Next Decade" announced by the Government of Japan in February 2023.

As for Japan's nuclear power generation methods, currently, only the light-water reactor is in commercial operation. Nuclear power is capable of supplying large amounts of stable decarbonized electricity, and over 90% of the equipment used in many of Japan's nuclear power plants is domestically produced, providing the advantage of accumulating know-how, including technology, within the country. Additionally, it plays the role of a baseload power source supporting renewable energy, which is an intermittent energy source, and in the future, it is expected to respond to diverse societal demands such as carbon-free hydrogen production and heat utilization.

On the other hand, Japan has experienced various incidents related to nuclear facilities, most notably the Fukushima Daiichi Nuclear Power Plant accident in 2011, although there were incidents that did not lead to accidents. In the development of nuclear technology, it is paramount to prioritize safety, as well as to advance research and development aimed at enhancing the safety of light-water reactors and nuclear innovations utilizing cutting-edge technologies. In the future, with further technological development, the goal is to achieve a reduction in the harmfulness and volume of radioactive waste and to enhance resource circulation through the effective use of resources, all while maintaining the basic principles of "S+3E," which includes ensuring safety as a premise, stable supply, economic efficiency, and environmental compatibility.

In the construction of the aforementioned current light water reactors, China and Russia are dominating the market with government support, while advanced countries including the United States, United Kingdom, and Canada are advancing the research and development of small reactors and innovative reactors, investing large-scale government budgets with the aim of commercializing them around 2030.

The Government of Japan aims to: ① Steadily promote the development of fast reactors utilizing international collaboration, ② Demonstrate the technology of small modular reactors

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

through international collaboration by 2030, ③ Establish component technologies related to hydrogen production in high-temperature gas reactors by 2030, and ④ Steadily promote nuclear fusion research and development through international collaboration, such as the ITER project.

This Framework now includes the "Support Project for Technological Development and Supply Chain Construction for the Development and Construction of Next-Generation Innovative Reactors." The purpose of these funds is to support the technological development necessary for realizing innovative light water reactors and small light water reactors included in next-generation innovative reactors with newly integrated safety mechanisms, and to enhance the supply chain. This aims to promote the practical development for the development and construction of next-generation innovative reactors, as well as to maintain and strengthen the nuclear industry base. Specific fund uses mentioned are "technological development of next-generation innovative reactors" and "strengthening the industrial base for the development and construction of next-generation innovative reactors".

Regarding the "Technology Development of Next-Generation Innovative Reactors," there are examples such as the development of equipment like steam generators in a pressurized water nuclear plant that incorporates new mechanisms in innovative light water reactors. Additionally, there is the technology development of devices like core catchers, which prevent the molten material of a reactor from leaking out of the reactor containment vessel in case of a core meltdown, and the double cylinders that contain inert gases or hydrogen to prevent over-pressurization and damage to the nuclear containment vessel during a severe accident. Additionally, in efforts to enhance safety in small light-water reactors, examples include the implementation of integrated isolation valves that are installed with the reactor to isolate the turbine from the reactor by closing during abnormalities. These isolation valves are set up midway on the main piping that sends steam from the reactor pressure vessel to the power-generating turbine. There is also the development of technology concerning cooling systems, where the coolant, such as water, continues to naturally circulate within the reactor even if the external circulation system is cut off.

"Regarding the strengthening of industrial infrastructure for the development and construction of next-generation innovative reactors," the funding will be allocated for research and development related to the enhancement of the supply chain for equipment and components materials necessary for the development of innovative light water reactors and small light water reactors, as well as for the development of manufacturing technology and manufacturing demonstration.

Based on the above, JCR evaluates that any of the projects newly added as examples to the framework involve research and development or demonstration research related to next-generation innovative reactors, and these are regarded as important initiatives toward future decarbonization in Japan.

No.3.2 Establishing electricity and gas markets to achieve carbon neutrality

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

3) Green category: Low-carbon and decarbonized energy

Table 4.3: Low-carbon and decarbonized energy "Utilization of nuclear power" "Establishing electricity and gas markets to achieve carbon neutrality"

No.3.2 Establishing electricity and gas markets to achieve carbon neutrality
Towards the expansion of **decarbonized power such as renewable energy and nuclear power**, and low-carbon and decarbonized energy such as hydrogen and ammonia, the necessary environment **will be further developed through measures** such as research and development, establishment of domestic advanced research hubs, **enhancement of grid infrastructure, securing flexibility, alongside support for long-term and large scale continued investment by power utilities for decarbonized power sources.** ＜Related key **sector-specific investment roadmaps**, technology roadmaps＞ **Sector-specific investment roadmaps: Next-Generation Renewable Energy, Hydrogen and its derivatives, Nuclear power** Technology roadmaps: Power sector, Gas sector, Oil Sector
＜Examples of initiatives (overview, etc.)＞ ● Support program for the establishment of large-scale hydrogen supply chains ➢ Creating a positive cycle of large-scale hydrogen demand creation and supply cost reduction through technology development such as scaling up transportation infrastructure and large-scale hydrogen transportation verification for multiple hydrogen carriers (liquefied hydrogen, MCH[36]), and demonstration of hydrogen combustion stability in actual hydrogen power generation systems ➢ Criteria example: Supply cost: below 30 yen/Nm3 by 2030 and below 20 yen/Nm3 by 2050 (CIF cost. Aim to reduce costs to a level comparable to fossil fuels)

No.3.2 supports research and development related to zero-emission thermal power, assistance for the installation of equipment related to the construction of a hydrogen and ammonia supply chain, as well as long-term and large-scale continuous investment by electric utility companies to expand decarbonized power sources such as renewable energy and nuclear power generation. This time, the Government of Japan has added support for long-term and large-scale continuous investments by electricity providers regarding decarbonized power sources, including existing nuclear power plants, as a new allocation of funds. Among the uses of the above funds, the matters concerning nuclear power generation are not listed as examples in the "Green Bond Principles" and "Green Bond Guidelines" according to the Use of Proceed No. 3.1. However, they are positioned as one of the initiatives aimed at achieving the Government of Japan's goal of net zero by 2050. Regarding the use of funds other than those mentioned, it falls under "environmentally adaptive products, environmentally friendly production technologies and processes" in the "Green Bond Principles" and the fund uses exemplified in the "Green Bond Guidelines," specifically relating to "businesses concerning products, manufacturing technologies, and processes adapted to the circular economy and environmentally considerate products."

In the revision of this Framework, support for long-term and large-scale continuous investment by electric utility companies in renewable energy and nuclear power generation has been added as a use of funds.

In the 7th Strategic Energy Plan, announced in February 2025, it was indicated that the energy mix for the FY 2040 will include renewable energy accounting for 40-50% and nuclear power

[36] Abbreviation for Methylcyclohexane

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

generation covering about 20%. Compared to the energy mix for the FY 2030 outlined in the 6th Strategic Energy Plan announced in 2021, renewable energy is expected to increase by several percent to over ten percent, while the use of nuclear power remains almost flat. On the other hand, the forecast for electricity generation in FY 2040 is approximately 1.1 trillion to 1.2 trillion kWh, surpassing the 934 billion kWh expected for FY 2030 as indicated in the 6th Strategic Energy Plan. This is because it is assumed that power demand will increase with the future progress of DX and GX. Renewable energy and nuclear power are highly anticipated as carbon-free and decarbonized energy sources.

Significant investments have already been made by electricity suppliers in decarbonized power sources such as renewable energy and nuclear power. However, considering the energy mix indicated in the 7th Strategic Energy Plan, ongoing investment will continue to be essential.

Regarding renewable energy, the Sector-Specific Investment Strategy Ver2 announced by the government in December 2024 states that approximately 20 trillion yen will be needed for renewable energy and about 11 trillion yen will be required to build next-generation networks that supply power to consumers. Regarding nuclear power, additional safety measures for existing power plants to comply with the new regulatory standards set by the Nuclear Regulation Authority are estimated to cost an average of about 266.2 billion yen per unit. It is expected that existing nuclear power plants aiming to conform to the new standards will require similar expenditures. Furthermore, considering the recent surge in the prices of raw materials and the increase in labor costs, it is conceivable that the additional safety measures' costs could exceed initial expectations.

For power companies that have already made significant investments, the above-mentioned investment is expected to be an additional financial burden. When considering the power energy mix aimed at achieving net zero by 2050, it is anticipated that investments in hydrogen and ammonia, which serve as fuels for zero-emission thermal power, as well as investments related to CCS and CCUS initiatives concerning emitted CO_2, will arise. Therefore, JCR evaluates that providing financial support to the initiatives of power generation companies concerning decarbonizing power sources like renewable energy and nuclear power plants is critical in Japan's efforts towards carbon neutrality.

It is important that the handling and disposal methods for the spent fuel generated from the operation of nuclear power plants are determined in order to identify and limit negative impacts on the environment. Regarding the reprocessing of spent fuel, the construction of a reprocessing plant by Japan Nuclear Fuel Limited is underway in Rokkasho, Aomori Prefecture, and completion is scheduled within FY 2026. Additionally, according to the "Law on the Final Disposal of Specified Radioactive Waste" enacted in 2000, the plan for the final disposal of high-level radioactive waste stipulates that high-level radioactive waste remaining after the reprocessing of spent fuel from nuclear power generation is to be vitrified and disposed of in geological layers more than 300 meters deep. In the "Plan for the Final Disposal of Specified Radioactive Waste," approved by the Cabinet in March 2008, it was established that a preliminary survey would be conducted following a literature review, then a detailed survey area would be selected by the mid-2020s, the final disposal facility site would be chosen around the year 2040, and the operation would start by the late 2040s. In 2015, a revision was made to the basic policy concerning the final disposal of specific radioactive waste, ensuring that the responsibility of the current generation is not deferred to future generations by steadily advancing measures for geological disposal. It also mentioned securing reversibility and retrievability, allowing future generations to develop

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

technology in such a way that they can choose the best disposal method. This policy was revised in 2023, highlighting efforts towards final disposal under the government's responsibility and indicating a further strengthening of national involvement.

In Japan, the Nuclear Waste Management Organization (NUMO), the implementing body for geological disposal, has been working on site selection since its establishment in 2000, following the aforementioned policy.

Currently, the research stage involves a literature survey, and a survey is being conducted in the three locations of Suttsu Town and Kamoenai Village in Hokkaido, and Genkai Town in Saga Prefecture.

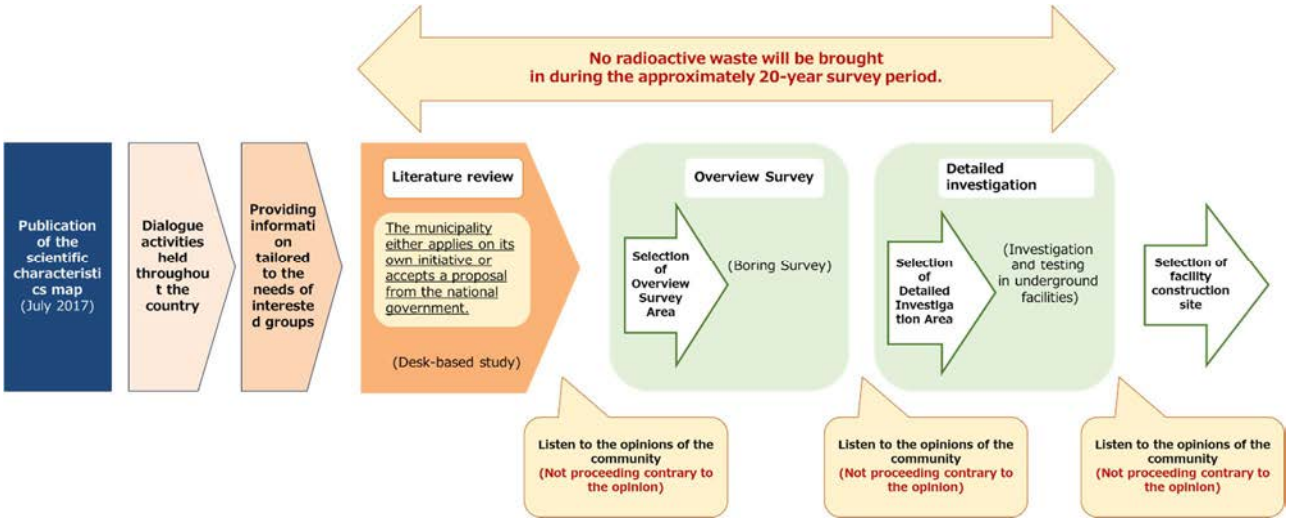


Figure 13: Flow of Radioactive Waste Disposal[37]

The JCR considers that the construction of a final disposal site for high-level radioactive waste is important for identifying and limiting the negative impact of existing nuclear power plants on the environment.2

As indicated in the above figure from the Agency for Natural Resources and Energy, a considerable amount of time is required between the literature survey and the operation of the final disposal site due to investigations and hearings of opinions at candidate sites. Therefore, at this evaluation point, there is a high likelihood that the initial final disposal plan will exceed the designated period in the late 2040s (by 2037).

On the other hand, it is also true that the process regarding the selection of the final disposal site, which had not been progressing, has now reached the stage of document investigation. At JCR, considering the current situation and progress regarding the selection of a final disposal site for high-level radioactive waste in Japan as mentioned above, the process is evaluated to likely advance in stages, also assessing that the negative environmental impacts due to nuclear power plants are likely to be identified and confined.

[37]Source: METI Website (Translated by JCR)
https://www.enecho.meti.go.jp/about/special/johoteikyo/energykihonkeikaku2021_kaisetu08.html

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

(4) Use of proceeds 4: Clean transportation

No.4.1 GX in transport sector

This Framework on the Use of Proceeds

4) Green category: Clean transportation

Table 4.4: Clean transportation "GX in transport sector" "Infrastructure" (repeat)

Green Category: Clean Transportation
No 4.1 GX in transport sector
In the transportation sector, which accounts for approximately 20% of our country's CO_2 emissions, to improve energy efficiency in each transportation mode such as railways and logistics and passenger flow, and transformation of demand structure towards the expansion of utilization of non-fossil fuel, Japan will systematically and strategically promote initiatives for the transition to clean energy over 10 years, taking into account the Act on Rationalizing Energy Use and Shifting to Non-fossil Energy, etc. Japan will also aim to expand private investment **and create a market for** in related industries such as transportation businesses. ＜Related key **sector-specific investment roadmaps,** technology roadmaps＞ **Sector-specific Investment Roadmaps: Automobiles, Aircraft, Sustainable Aviation Fuel (SAF), Ships, Life-related Industry** Technology roadmaps: Automobile sector, Oil sector, International shipping sector, Domestic shipping sector, Aviation sector
＜Examples of initiatives (overview, etc.)＞ ● **Support Project for Sustainable Aviation Fuel (SAF) Production and Supply Chain Development** ➢ **Support for capital investment towards entities conducting large-scale domestic SAF production projects contributing to GX, to build an environment where SAF can be supplied stably at a globally-competitive price.** ● **Promotion of the construction of zero-emission ships etc.** ➢ **In order to make a supply foundation needed for the deployment of zero-emission ships etc. using hydrogen/ammonia as fuels, which are necessary for achieving carbon neutrality in 2050, support will be provided for capital investment for building and expanding production of capacity engines, fuel tanks, fuel supply systems and other facilities necessary for construction and their instalment.** ● Support program for promoting the introduction of clean energy vehicles ➢ Support for the purchase cost of electric vehicles, fuel cell vehicles and plug-in hybrid vehicles, etc., in the early stages of adoption ➢ Criteria example: Being eligible vehicles for the FY 2030 fuel efficiency standards under the Top Runner Program of the Act on Rationalizing Energy Use ● Support program for promoting the electrification of commercial vehicles ➢ Support for adoption acceleration of the electrification of commercial vehicles (trucks and taxis) ➢ Criteria example: Setting up plans for the introduction of non-fossil fuel vehicles in accordance with the goals set by the government (e.g., replacing 5% of small trucks under 8 tons with non-fossil fuel vehicles by FY 2030), etc. ● Development and demonstration projects for next-generation aircraft ➢ Technology development of core technologies for hydrogen-powered aircraft ➢ Criteria example: Engine combustor: 54% reduction in NOx[38] emissions compared to CAEP/8 Hydrogen fuel storage tank: Achieving a weight of less than twice of stored hydrogen fuel Aircraft design: Confirmation of the conceptual design of a hydrogen-powered aircraft with a range of 2,000-3,000km through wind tunnel testing

[38] Abbreviation for Nitrogen oxides

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

The purpose of No. 4.1 remains unchanged from the previous evaluation; it is to support research and development and equipment introduction aimed at decarbonization in the fields of automobiles, aircraft, and ships. The Government of Japan has recently added "Support Project for Sustainable Aviation Fuel (SAF) Production and Supply Chain Development" and "Promotion of the construction of zero-emission ships etc." as examples of business uses for these funds. Both projects were already funded by the CT government bonds issued in FY 2024.

(i) "Support Project for Sustainable Aviation Fuel (SAF) Production and Supply Chain Development"

Aviation has a higher amount of CO_2 emissions per unit of transportation compared to other public transport modes (buses and trains) [39], efforts to decarbonize aviation are considered essential in achieving carbon neutrality. At the 41st ICAO Assembly held in October 2022, a long-term global aspirational goal (LTAG) [40] to reduce CO_2 emissions in the international aviation sector to net zero by 2050 was adopted, signaling an accelerated global commitment to decarbonizing aviation.

SAF is attracting attention as a decarbonization fuel playing a crucial role in enabling decarbonization in large aircraft, which are difficult to electrify or hydrogenate. It is also positioned as a major policy in the roadmap for promoting the decarbonization of aviation formulated by the Ministry of Land, Infrastructure, Transport and Tourism. Furthermore, the Government of Japan has set a target for SAF usage by 2030, aiming to replace 10% of domestic airline fuel consumption with SAF[41]. Furthermore, in order to encourage the supply of SAFs with higher carbon reduction value, there is a recognized need to evaluate based on the GHG reduction amount, taking into consideration the GHG reduction effects. The "Public-Private Council for Promoting the Introduction of Sustainable Aviation Fuel (SAF)" is considering setting the SAF supply target volume for the target period (FYs 2030-2034) to be "equivalent to 5% or more of the GHG emissions from jet fuel produced and supplied domestically in 2019 in Japan.[42]"

SAF is aviation fuel produced from sustainable sources other than fossil fuels, such as waste cooking oil and animal or vegetable fats. It is said to reduce CO_2 emissions by approximately 60 to 80% compared to traditional fossil fuels[43]. As of 2022, the global supply of SAF (Sustainable Aviation Fuel) is approximately 300,000 kl, which is about 0.1% of the world's jet fuel supply. However, according to IATA's estimates, to achieve net zero by 2050, the required amount of SAF is 449 billion liters (450 million kl), which is 1.5 times the world's jet fuel supply as of 2022. The purpose of this project is to establish a stable supply system of SAF domestically by supporting capital investment and other initiatives for operators who will conduct large-scale SAF production in Japan, in anticipation of the increasing international demand for SAF as the aviation sector moves towards decarbonization. As a result, this is expected to lead to opportunities for economic growth by supplying domestically produced SAF to the Asian regions

[39] https://www.mlit.go.jp/sogoseisaku/environment/sosei_environment_tk_000007.html
The amount of CO_2 per transportation is extremely higher than that of the previous year since users of transportation decreased due to the spread of the new coronavirus infection; therefore, the 2019 data are used.

[40] ICAO News Release at https://www.icao.int/Newsroom/Pages/States-adopts-netzero-2050-aspirational-goal-for-international-flight-operations.aspx

[41] Reference material for basic policy towards realizing GX
https://www.meti.go.jp/press/2022/02/20230210002/20230210002_3.pdf

[42] Jet fuel produced and supplied in Japan in FY2019 x SAF blend rate of 10% x GHG reduction effect equivalent to 50%

[43] Based on CO_2 emissions in life cycles (including emissions from processes, such as cultivation, harvesting, manufacturing and transportation of raw materials). The actual CO_2 reduction effect is lower than the above value since the upper limit of mixing with conventional fuel is currently set in the ASTM standard.

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

with expanding domestic and aviation demand, the securing of national security by domestic production of aviation fuel, and support for the transition of the petroleum industry to a decarbonization business.

The following four companies have been selected for the budget project for the FY 2024.

Company Name	Location of Project Implementation	Manufacturing Technology	SAF Production Volume
Idemitsu Kosan Co., Ltd.	Yamaguchi Prefecture	HEFA[44]	After Fiscal Year 2028 250,000 kL per year
ENEOS Corporation	Wakayama Prefecture	HEFA	From fiscal year 2028, 400,000 kL annually
Taiyo Oil Co., Ltd.	Okinawa Prefecture	AtJ[45]	From fiscal year 2029, 200,000 kL annually
Cosmo Oil Co., Ltd.	Kagawa Prefecture	AtJ	From 2029 onwards, 150,000 kL annually

(ii)Promotion of the construction of zero-emission ships etc.

<Maritime Sector>

Shipping is divided into coastal shipping, which operates domestically, and international shipping, which operates between two or more countries. Regarding coastal shipping, since the operational range is limited to within Japan, it follows the GHG targets of each country based on the Paris Agreement, whereas for international shipping, it follows the targets agreed upon by the International Maritime Organization (IMO). The GHG emission targets for international shipping by IMO are as follows:

[Overview of the International Shipping GHG Emission Reduction Strategy]

In July 2023, the 80th session of the IMO Marine Environment Protection Committee (MEPC 80) was held in London, UK, where the targets related to GHG emissions were revised in a more strengthened form.

Aiming for achievement through measures (rules) formulated by the IMO, three objectives were established.

① Achieve zero GHG emissions by around 2050 ② Increase the use ratio of zero-emission fuels, etc., to 5-10% by 2030 ③ Reduce CO_2 emissions from international shipping overall (per transport volume) by 40% by 2030

Additionally, reduction guidelines for the coming years were indicated below in order to achieve the zero GHG emissions target by around 2050.

[44] HEFA (Hydroprocessed Esters and Fatty Acids) is a method of producing SAF by hydrogenating fatty acid esters found in waste cooking oil, vegetable oil, and animal oil into saturated hydrocarbons, and then distilling them.
[45] AtJ (Alcohol to Jet) is a method of producing SAF by dehydrating biomass-derived isobutanol or ethanol to create ethylene, oligomerizing and hydrogenating the ethylene to form saturated hydrocarbons, and then distilling them.

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

① Reduce GHG emissions by 20~30% by 2030 (compared to 2008 levels) ② Reduce GHG emissions by 70~80% by 2040 (compared to 2008 levels)

[Overview of the Domestic Maritime Shipping GHG Emission Reduction Strategy]

Furthermore, efforts towards zero-emission ships in domestic vessels are outlined in the report compiled by the "Study Group for Promoting Domestic Carbon Neutral" which was established by the Ministry of Land, Infrastructure, Transport and Tourism in 2021. In it, a CO_2 emissions reduction target has been set, aiming for an approximate decrease of 1.81 million tons of CO_2 compared to FY2013 by FY2030. This includes the introduction of energy-saving equipment and innovative ship designs, as well as ingenuity in operations, and achieving CO_2 reductions through fuel conversion. Furthermore, in March 2025, a new greenhouse gas reduction target for domestic shipping for the year 2040 was set: a reduction of 3.87 million tons of CO_2 compared to FY 2013 when considering modal shifts, and a reduction of 4.25 million tons of CO_2 compared to FY 2013 without considering modal shifts.

[Green Growth Strategy Towards Carbon Neutrality: Ship Schedule]

In October 2020, Japan declared its aim for "carbon neutrality by 2050." To achieve this, the Ministry of Economy, Trade and Industry worked in cooperation with related ministries and agencies to formulate the "Green Growth Strategy in Line with Carbon Neutral by 2050 ('Green Growth Strategy')." This strategy is an industrial policy aimed at connecting the challenge of "Carbon Neutral by 2050" to a "positive cycle of economy and environment." This aims to acquire technological capabilities related to LNG, hydrogen, ammonia, and other gas fuel development essential for achieving zero emissions in the shipbuilding industry, to lead the development of international standards, and to strengthen the international competitiveness of Japan's shipbuilding and shipping industries while working towards carbon neutrality in maritime transport. The "Roadmap" until 2050 outlined in the Green Growth Strategy consists mainly of three measures: ① transition to carbon-free alternative fuels, ② improving the efficiency of LNG-fueled ships, and ③ building an international framework.

In addition, according to the Sector-specific Investment Strategies for ships announced in 2024, it is indicated that efforts will be made to advance the spread of zero-emission ships for both domestic and international voyages to achieve carbon neutrality by 2050. Also, the strategy aims to promote the spread of fuel carriers and offshore wind turbine operation ships that support the stable supply of Japan's clean energy. As specific measures, the introduction of zero-emission ships, the establishment of a domestic production base, and the promotion of the development of educational and training environments for crew members are indicated.

For proactive investment towards GX, "investment related to the establishment of a production base for zero-emission ships" and "investment related to the introduction of zero-emission ships" are mentioned as targets. With the revision of this Framework, the " Promotion of the construction of zero-emission ships etc." has been added as an example of fund usage. This is a project aimed at enhancing the international competitiveness of the domestic shipping industry, while simultaneously promoting the reduction of CO_2 emissions through the market introduction of ships. This is to be achieved by establishing the supply infrastructure for zero-emission ships, such as those using ammonia and hydrogen fuels, which are essential for achieving carbon neutrality by 2050, as indicated in the Sector-specific Investment Strategies.

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

Specifically, the following projects are envisaged.

- Development and enhancement of production facilities for engines, fuel tanks, fuel supply systems, etc., required for the construction of zero-emission ships.

- Development and enhancement of facilities, etc., for installing (fitting) the above marine equipment on ships are anticipated subsidies and support for capital investment when constructing the supply chain necessary for manufacturing zero-emission ships. By further promoting the construction of zero-emission ships, the decarbonization of Japanese vessels can be achieved, leading to the strengthening of Japan's maritime industry through the build-up of supply chains, JCR evaluates.

Based on the above, JCR assesses that all of the newly added projects in the framework strongly support decarbonization in the aviation and shipping sectors and align with Japan's policies determined for achieving the NDC.

No.4.2 Infrastructure (repeat)

This Framework on the Use of Proceeds

4) Green category: Clean transportation

Table 4.4: Clean transportation "GX in transport sector" "Infrastructure" (repeat)

No 4.2 Infrastructure (repeat)
Promotion of the formation of Carbon Neutral Ports (CNPs) and decarbonization in construction work to achieve decarbonization and enhance competitiveness in industries and ports. Promotion of renewable energy introduction and thorough energy consumption reduction by utilizing various infrastructures such as airports, roads, dams and sewage systems. Advancing the development of cities and regions that contribute to decarbonization ＜Related key **sector-specific roadmaps**, technology roadmaps＞ **Sector-specific investment roadmaps: Life-related Industry**

In the previous evaluation, JCR assessed this use of proceeds as appropriate. In the JCR, the changes in this revised framework refer to the update of the "Related Key Policy Roadmaps" from "Policy roadmaps (based on the Basic Policy for the Realization of GX)" to "Sector-specific Investment Roadmaps (based on the Sector-specific Investment Strategies)," and since it only involves updating the content, it continues to be assessed as appropriate.

(5) Use of proceeds 5: Circular economy adapted products, production technologies and processes

No.5.1 Restructuring the manufacturing industry (fuel and feedstocks transition)

This Framework on the Use of Proceeds

5) Green category: Circular economy adapted products, production technologies and processes

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

Table 4.5: Circular economy adapted products, production technologies and processes "Restructuring the manufacturing industry (fuel and feedstocks transition)" "Facilitating introduction of hydrogen and ammonia" "Carbon Recycling and CCS"

Green category: Circular economy adapted products, production technologies and processes
No 5.1 Restructuring the manufacturing industry (fuel and feedstocks transition)
To address the GX market growing worldwide, in the manufacturing industry which accounts for a significant portion of CO_2 emissions after electricity and heat distribution, Japan will swiftly establish a GX supply chain through research and development as well as capital investment support, and engage in market creation etc., in new GX fields ＜Related **sector-specific investment roadmaps**, technology roadmaps＞ **Sector-specific investment roadmaps**: **Steel, Chemicals, Cement, Paper and Pulp** Technology roadmaps: Iron and Steel sector, Chemical sector, Paper and Pulp sector, Cement sector
＜Examples of initiatives (overview, etc.)＞ ● **Support for energy/manufacturing process conversion for hard-to-abate industries** ➢ **Support for capital investment leading to swifter deployment of facilities leading to emissions reduction and increased competitiveness in hard-to-abate industries** ● Development and demonstration projects for the utilization of hydrogen in the iron and steel production process ➢ Research and development towards the establishment and societal implementation of decarbonization technologies, including hydrogen reduction steelmaking, in anticipation of a future where cost-effective and abundant hydrogen supply infrastructure is established ➢ Criteria example: Establishment of hydrogen reduction technology in blast furnaces to achieve over 50% reduction of CO_2 emissions. Establishment of direct hydrogen reduction technology to achieve over 50% reduction of CO_2 emissions ● Development and demonstration projects for decarbonization of thermal processes in the manufacturing sector ➢ Utilization of zero-emission fuels and development and demonstration of efficient thermal processes to address decarbonization of industrial furnaces ➢ Criteria example: Establishment of industrial furnaces with 50% co-firing capability of existing fuels such as natural gas and hydrogen and ammonia by FY 2031. Establishment of technologies to reduce peak power consumption, etc., by 30% or more by FY 2031.

Funding Purpose No. 5.1 remains unchanged since the last evaluation and involves supporting research and development, as well as capital investment, aimed at reducing GHG emissions for the manufacturing industry, which constitutes a significant portion of CO_2 emissions after electricity and heat allocation. Recently, the Government of Japan has added the " Support for energy/manufacturing process conversion for hard-to-abate industries" to the list of business examples for this funding purpose. This business is already a use of funds associated with the CT government bonds issued in FY Reiwa 6.

This project envisions two main operations. One is to provide investment support for transitioning from the traditional manufacturing processes, which result in substantial CO_2 emissions, to new low-emission manufacturing processes in industries where emission reduction is challenging, such as the steel, chemical, paper pulp, and cement sectors. The target projects in each sector are as follows.

① Steel: Shift from traditional blast furnaces and converters to innovative electric furnaces that significantly reduce CO_2 emissions, introduction of steelmaking processes utilizing hydrogen.

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

② Chemicals: Transition to chemical recycling that utilizes waste plastics, etc., to reduce the amount of naphtha raw material used, and transition to bio-based raw materials made from plants, etc., with low life cycle CO_2 emissions.

③ Paper Pulp: Transition to bio-refinery industry utilizing wood pulp, which has the potential to serve as an alternative material to fossil fuel-based products.

④ Cement: Expanding production of carbon recycling cement through fuel conversion in the firing process and coal power plant boilers, and implementation of CO_2 capture technology during cement production (raw material conversion).

The selected entities for the FY 2024 budget projects are the following two companies:

Company Name	Location of Project Implementation	Implementation Business Description
JFE Steel Corporation	Okayama Prefecture	Process Shift to Innovative Electric Furnace
Nippon Paper Industries Co., Ltd.	Miyagi Prefecture	Project to Strengthen Biomass Product Competitiveness by Reducing GHG Emissions at the Ishinomaki Mill

Another aspect is to support the shift to fuels that contribute to significant emission reductions in on-site power generation facilities and boilers that use coal and others as fuel. In the Sector-specific Investment Strategies, as measures for fuel conversion from coal, ammonia is mentioned for chemicals, black liquor (a byproduct of pulp production from wood) and gas for paper and pulp, and mainly waste and biomass for cement. According to the carbon neutral strategies published by Japan's major cement companies, the cement sector is expected to use waste, hydrogen, ammonia exclusive combustion, and synthetic methane as fuels following a transition.

Based on the above, JCR evaluates that the projects newly added to the framework are initiatives to support decarbonization in the manufacturing industry, which is responsible for a large portion of CO_2 emissions, and align with the policies, such as the technology roadmaps for each sector set by the Government of Japan to achieve the NDCs.

No.5.2 Facilitating introduction of hydrogen and ammonia

This Framework on the Use of Proceeds

5) Green category: Circular economy adapted products and production technologies and processes

Table 4.5: Circular economy adapted products, production technologies and processes "Restructuring the manufacturing industry (fuel and feedstocks transition)" "Facilitating introduction of hydrogen and ammonia" "Carbon Recycling and CCS"

No 5.2 Facilitating introduction of hydrogen and ammonia
In order to achieve the domestic introduction targets of 3 million tons of hydrogen and 3 million tons (ammonia equivalent) of ammonia by 2030, and 20 million tons of hydrogen and 30 million tons (ammonia equivalent) of ammonia

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

by 2050, efforts will be made over 10 years to establish a large-scale and robust supply chain (manufacturing, transportation, utilization) **such as** through the support system for supply chain development and the support system for base development

＜Related key **sector-specific investment roadmaps**, technology roadmaps＞
Sector-specific investment roadmaps: Hydrogen and its derivatives
Technology roadmaps: Power sector, Gas sector, Oil sector

＜Examples of initiatives (overview, etc.)＞

- **Support focusing on the price gap to build supply chains for hydrogen and its derivatives**
  - **Support focusing on the price gap between low-carbon hydrogen and its derivatives compared to existing materials/fuels that they substitute**
- **Hydrogen Hub Development Program**
  - **Support for shared facilities that merit a variety of entities leading to wide-scale expanded use of low-carbon hydrogen and its derivatives, aiming for building an independent pilot supply chain around FY 2030**
- Development and demonstration projects for the establishment of a large-scale hydrogen supply chain
  - Creating a positive cycle of large-scale hydrogen demand creation and supply cost reduction through technology development such as scaling up transportation infrastructure and large-scale hydrogen transportation verification for multiple hydrogen carriers (liquefied hydrogen, MCH), and demonstration of hydrogen combustion stability in actual hydrogen power generation systems
  - Criteria example: Supply cost: below 30 yen/Nm3 by 2030 and below 20 yen/Nm3 by 2050 (CIF cost. Aim to reduce costs to a level comparable to fossil fuels)
  -

This includes supporting shared facilities that lead to the large-scale expansion of low-carbon hydrogen use and widely benefit various businesses. Fund utilization No. 5.2 remains unchanged since the last evaluation, supporting research and development and facility introduction to promote the introduction of hydrogen and ammonia. This time, the Government of Japan has added examples of business uses for these funds, including a "support project focusing on price differences for the construction of supply chains for hydrogen and others" and a "support project for the development of hydrogen and other bases." This project is already a use for the proceeds issued through the Japan Climate Transition Bond in FY2024.

As stated in the previous evaluation report, hydrogen and ammonia are expected to be utilized for decarbonization based on the technical roadmaps of various sectors such as electricity, gas, automobiles, steel, cement, shipping, and railways. Following the previous evaluation, in Japan, the Hydrogen Society Promotion Act will come into effect on October 23, 2024, accelerating the transition toward a hydrogen and ammonia society.

Herein, details of the two additional projects added by the Government of Japan as examples of fund usage are shown.

① Support focusing on the price gap to build supply chains for hydrogen and its derivatives

This project, considered by the Government of Japan, plans to provide long-term support for the difference (partial or full) between the reference price (the price parity with existing fuels) and the standard price (a price that recovers costs and ensures reasonable profit) for hydrogen supplied by businesses intending to commence the provision of low-carbon hydrogen around the year 2030. This project already has the funding source from Japan Climate Transition Bond issued in FY2024.

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

The standards for low-carbon hydrogen, etc., are defined by the Hydrogen Society Promotion Law. Specifically, in the case of hydrogen, according to the calculation method of the International Partnership for Hydrogen and Fuel Cells in the Economy (IPHE), hydrogen is defined as low-carbon hydrogen if the CO_2 emissions at the Well to Production Gate[46] stage is 3.4 kg-CO_{2e}/kg-H_2 or less in the production of 1 kg of hydrogen. Regarding this carbon intensity, the EU's Renewable Energy Directive[47] (RED) uses a benchmark of 3.4 kg-CO_{2e}/kg-H_2, while the US Clean Hydrogen Production Standard[48] (CHPS) uses a benchmark of 4 kg-CO_{2e}/kg-H_2. The Japan Credit Rating Agency (JCR) believes that the Government of Japan's standard for low-carbon hydrogen is on par with international standards. The Government of Japan plans to review the low-carbon hydrogen standard as necessary, taking into account future technological advancements and other factors. JCR evaluates that this support scheme is also intended for use of funds and promotes the transition towards a hydrogen society in Japan. Meanwhile, the EU taxonomy[49] or the UK Low Carbon Hydrogen Standard[50] have set stricter standards than the Government of Japan's low-carbon hydrogen standards. However, considering the cost of Japan's renewable energy, JCR believes that these standards are currently difficult to achieve.

Additionally, the criteria for carbon intensity regarding ammonia, synthetic fuels, and synthetic methane are set by the Hydrogen Society Promotion Act. The standard for low-carbon ammonia specifies that the CO_2 emissions over the Gate-to-Gate process (including hydrogen production) when producing 1 kg of ammonia from hydrogen as a raw material must be 0.84 kg-CO_{2e}/kg-NH_3 or less. This carbon intensity is established by considering Japan's circumstances while also referencing international hydrogen standards. Currently, the setting is configured as Gate to Gate only during production, but this is because there is no accurate data on the CO_2 emissions that include the use of pipelines up to the production and supply of natural gas.

In the future, CO_2 emitted from raw material production will also be included in the standard. The newly added project is assessed by JCR as important for promoting the use of low-carbon hydrogen, etc., in Japan.

② Hydrogen Hub Development Program

Regarding this project, one example includes support for a portion of the development costs (design costs and capital investment) related to shared facilities needed for the reception and transportation of low-carbon hydrogen and other gases scheduled to be built by FY 2030. In the use of these funds, as a supply chain for hydrogen and other resources is developed through the establishment of large-scale hydrogen supply chains and price gap support projects, it is expected to promote the discovery and accumulation of surrounding potential needs by supporting equipment that broadly benefits various businesses. Currently, investigations regarding the development of supply infrastructure such as hydrogen by companies are being conducted across Japan. As a use of funds within this Framework, shared infrastructure facilities' design and infrastructure development based on the Planning Recognition System under the Hydrogen Society Promotion Act are candidates for the coming FY and beyond. JCR

[46]From raw material production to the outlet of hydrogen production equipment
[47]Stipulate obligations of renewable fuels supply by suppliers
[48]Hydrogen Hub Project Grant Adoption Criteria, U.S. Department of Energy (DOE)
[49]A standard for sustainable finance to induce green investments
[50]British policy schemes used to determine grant eligibility

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

evaluates that this use of funds is intended to support private sector efforts by the government towards the construction of the hydrogen supply chain in Japan.

Based on the above, JCR evaluates that the projects added as examples in the current framework are measures supporting decarbonization through the promotion of low-carbon hydrogen and others.

No.5.3 Carbon Recycling and CCS

This Framework on the Use of Proceeds

5) Green category: Circular economy adapted products and production technologies and processes

Table 4.5: Circular economy adapted products, production technologies and processes "Restructuring the manufacturing industry (fuel and feedstocks transition)" "Facilitating introduction of hydrogen and ammonia" "Carbon Recycling and CCS"

No 5.3 Carbon Recycling and CCS
Research and development, demonstration, and capital investment will be implemented over 10 years to promote the use of fuels that contribute to decarbonization, such as SAF (Sustainable Aviation Fuel), synthetic fuels and synthetic methane. Additionally, there will be efforts for the establishment of regulations and frameworks, and coordination towards international rules establishment**, and building supply chains,** **Additionally, a supply chain for bio-manufacturing through support for technology development aimed at social implementation will be built. Furthermore, regarding Carbon Capture and Utilization (CCU), the construction of a CO_2 supply chain will be promoted. For Carbon Capture and Storage (CCS), necessary improvement of the environment will be conducted through measures such as CCS cost difference measures for operations to begin in the early 2030s.** ＜Related key **sector-specific investment roadmaps**, technology roadmaps＞ **Sector-specific investment roadmaps: Sustainable Aviation Fuel (SAF), CCS, Resource Circulation** Technology roadmaps: Power sector, Gas sector, Oil sector
＜Examples of initiatives (overview, etc.)＞ ● Development and demonstration projects for control technologies to address feedstock variations in synthetic fuel production ➢ Development of control technologies for temperature, catalyst quantity, and other parameters to address feedstock variations in synthetic fuel production

In the previous evaluation, JCR assessed this use of proceeds as appropriate. The changes in this revised framework refer to the update of the "Related Key Policy Roadmaps" from "Policy roadmaps (based on the Basic Policy for the Realization of GX)" to "Sector-specific Investment Roadmaps (based on the Sector-specific Investment Strategies)." In addition, in consideration of the importance of building a supply chain for carbon recycled fuels, etc., additional information has been added. Furthermore, regarding CCUS, the content has been updated in light of the formulation of the Seventh Strategic Energy Plan and the establishment of the CCS Business Act[51]. Therefore, it only involves updating the content, it continues to be assessed as appropriate.

(6) Use of proceeds 6: Environmentally sustainable management of living natural resources and land use, Circular economy

[51] Official name: Act on Carbon Dioxide Storage Business

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

No.6.1 Food, agriculture, forestry, and fisheries industry

This Framework on the Use of Proceeds

6) Green category: Environmentally sustainable management of living natural resources and land use, Circular economy

Table 4.6: Environmentally sustainable management of living natural resources and land use, Circular economy

"Food, agriculture, forestry, and fisheries industry" "Resource circulation"

Green category: Environmentally sustainable management of living natural resources and land use, Circular economy
No 6.1 Food, agriculture, forestry, and fisheries industry
Based on the "Green Food System Strategy" (formulated in May 2021) and the "Act to Promote Environmental Burden Reduction Activities for Establishment of Environmentally Harmonized Food System" (enacted in April 2022, implemented in July 2022), efforts will be made to promote transformation in the food, agriculture, forestry, and fisheries industry towards decarbonization and reducing environmental impacts. Forests, farmland, algae fields, etc., which serve as production areas for the agriculture, forestry, and fisheries industry, play an essential role as carbon sinks in achieving carbon neutrality by 2050. From the viewpoint of attracting private investment, efforts will be made to strengthen these functions including behavioral changes among stakeholders ＜Related key **sector-specific investment roadmaps**, technology roadmaps＞ **Sector-specific investment roadmaps:　Life-related Industry**

In the previous evaluation, JCR assessed this use of proceeds as appropriate. In the JCR, the changes in this revised framework refer to the update of the "Related Key Policy Roadmaps" from "Policy roadmaps (based on the Basic Policy for the Realization of GX)" to "Sector-specific Investment Roadmaps (based on the Sector-specific Investment Strategies)," and since it only involves updating the content, it continues to be assessed as appropriate.

No.6.2 Resource circulation

This Framework on the Use of Proceeds

6) Green category: Environmentally sustainable management of living natural resources and land use, Circular economy

Table 4.6: Environmentally sustainable management of living natural resources and land use, Circular economy

"Food, agriculture, forestry, and fisheries industry" "Resource circulation"

Green category: Environmentally sustainable management of living natural resources and land use, Circular economy
No 6.2 Resource circulation
To promote resource circulation through the collaboration between production side and recycle side, and achieve autonomic and robust resource circulation systems, efforts will be made over 10 years to establish information distribution platforms utilizing digital technologies. Additionally, resource circulation market will be created through revision of regulatory frameworks towards the acceleration of the collaboration between production side and recycle side, and GX investment support based on the premise of structural reforms ＜Related key **sector-specific investment roadmaps**, technology roadmaps＞ **Sector-specific investment roadmaps: Resource circulation**
<Examples of initiatives (overview, etc.)>

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

- Development and demonstration projects aimed at achieving carbon neutrality in the waste and resource circulation sector
  - Development of technologies, etc., related to alternative treatment methods to conventional waste disposal systems, such as incineration, that release CO_2 into the atmosphere, etc.
  - Criteria example: By 2030, establishing technologies that realize the waste incineration facilities based on CO_2 separation and recovery, which ensures a stable carbon recovery rate of 90% or higher from waste under specific conditions

In the previous evaluation, JCR assessed this use of proceeds as appropriate. In the JCR, the changes in this revised framework refer to the update of the "Related Key Policy Roadmaps" from "Policy roadmaps (based on the Basic Policy for the Realization of GX)" to "Sector-specific Investment Roadmaps (based on the Sector-specific Investment Strategies)," and since it only involves updating the content, it continues to be assessed as appropriate.

Based on the above, JCR evaluates that the revised use of proceeds is aimed at projects where environmental improvement effects can be expected.

3. Selection Standards and Processes for Use of Proceeds

In this Framework, the selection criteria and process for the use of funds are defined as follows (the parts that are in bold and underlined are the changes this time). Note that only the framework after the changes is described below.

This Framework on the Process

3.2 Process for Project Evaluation and Selection

The compliance status regarding the adherence to eligible projects stipulated in "3.1 Use of Proceeds" for the allocated projects is confirmed within each relevant ministry or agency, followed by discussions in the Working Group of Experts for the Realization of GX, then included in the government's budget plan. In addition, an independent external reviewer confirms the planned allocation projects' alignment. Upon this, if needed, discussions between relevant agencies are conducted, and the projects are reported to the "Government-Related Ministries and Agencies Liaison Conference on GX Economy Transition Bond Issuance" (Liaison Conference), which consists of director-general level officials, and the GX Implementation Council. Additionally, each project is determined through the approval by the National Diet as part of the government budget annually. Members of the Liaison Conference are as follows.

- Cabinet Secretariat
- Financial Services Agency
- Ministry of Finance
- Ministry of Economy, Trade and Industry
- Ministry of the Environment

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

Furthermore, the aforementioned Liaison Conference also discusses the allocation reporting and impact reporting mentioned in 3.4 and conducts the confirmation and evaluation of the allocation status. As necessary, the results are reported to the “GX Implementation Council”.

JCR's Evaluation for the Framework

At the time of the previous evaluation, JCR rated the selection criteria and process for the use of funds described in this Framework as appropriate. In the JCR, the revision of this Framework is aligned with the content of the currently ongoing selection and evaluation process, confirming that there are no changes to the core parts of the criteria for selecting the use of funds and the process, and it is considered to remain appropriate.

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

4. Management of the Proceeds

Management of Procured Funds In this Framework, the management of procured funds is defined as follows (the bold and underlined parts indicate the recent changes). Note that only the updated framework is described below.

The Framework for Management of the Proceeds

3.3 Management of Proceeds

The Government of Japan will allocate the net proceeds to eligible projects. The eligible projects to be allocated are those that have started operations or have been executed in the FY[52] including the implementation date of funding based on the Framework, as well as projects that have started operations or executed in subsequent FYs and the previous FY.

The allocated projects are managed within the Special Account for Energy Measures, separate from other accounts. METI will track and monitor the amount of the net proceeds to match the actual expenses on an annual basis using an internal management system**.**

Until full allocation of the net proceeds, the unallocated proceeds will be managed in cash.

JCR's Evaluation for the Framework

At the time of the previous evaluation, JCR assessed the financial management described in this Framework as appropriate. In this revision of the framework, JCR has added the wording of "principles." In this revised framework, the main text remains unchanged, but the approach regarding tax measures has been clarified in the footnotes.

JCR has confirmed that there is no change in the actual handling, and we continue to assess it as appropriate.

[52] In the GX Promotion Act, it is stated that "the issuance of GX Economy Transition Bonds can be carried out until June 30th of the following year for each FY. In this case, the revenue related to GX Economy Transition Bonds issued after April 1st of the following FY shall be attributed to the revenue of the respective FY". Therefore, for example, funds raised from April 1st to June 30th in FY X may be attributed to the revenue of FY X-1. In this case, the FY X-1 becomes the "relevant FY" in this provision. **With regard to tax measures, the fiscal year in which the tax reduction amount is determined will be considered the "relevant fiscal year."**

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

5. Reporting

In the framework, the reporting is defined as follows (the sections that have been changed are in bold and underlined). Only the framework after the changes is described below.

The Framework for Reporting

3.4 Reporting

3.4.1 Overview of Reporting

After the fund raising based on the framework, the Government of Japan will provide allocation and impact reporting as follows. The reporting aims to go beyond disclosing the progress of eligible projects financed by the Framework and provide information that can be used as a reference for future allocation decisions by conducting appropriate project reviews similar to the verification of regular budget projects and taking into account the progress of the projects, their environmental improvement impacts, etc. Furthermore, disclosure of the midterm strategy and anticipated impacts of eligible projects will be made to the extent possible, strengthening companies' commitment and enabling market evaluation not only of the current financial performance but also of the content of upfront investments.

3.4.2 Allocation Reporting

Until the proceeds are fully allocated to eligible projects, the Government of Japan will report the allocation of net proceeds of GX Finance annually on its website, within the scope of confidentiality obligations and to the extent reasonably practicable, regarding any or all of the following items.

Should a significant change occur after the allocation of the proceeds, such change will be disclosed in a timely manner.

＜Reporting items＞

- The amount of net proceeds allocated to the eligible projects
- The amount of unallocated proceeds
- The estimated amount of the proceeds allocated to the projects in FY which ends before the issuance date

3.4.3 Impact Reporting

The Government of Japan will report the environmental impacts for each eligible criterion annually on its website, within the scope of confidentiality obligations and to the extent reasonably practicable, regarding any or all of the following items.

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

The initial report **for each issuance** will be conducted within two **fiscal** years **since** issuance, and subsequent progress reports will be conducted at least until the completion of the individual project period.

＜Reporting items＞

- Environmental improvement effects such as reduction in CO_2 emissions (expected reduction effects for research and development)
- Overview of main projects, allocated amount, number of projects adopted, case studies of project implementation, progress updates on research and development and capital investment, etc.

※Additionally, other indicators and criteria related to the project may be disclosed as needed

JCR's Evaluation for the Framework

At the time of the previous evaluation, JCR deemed the reporting of the allocation status of funds and environmental improvement effects documented in this Framework as appropriate. In the JCR, it was confirmed that in the newly revised framework, the approximation amount (or percentage) portion of the procured funds allocated to prior years at the time of issuance was removed, and that the fiscal-year annual referencing has been amended based on practices operated on a fiscal-year annual basis. The reporting items are considered appropriate because the estimated amounts are reported quantitatively, and the changes to the FY are also based on practical revisions, with the required reporting items maintained continuously.

Additionally, the Government of Japan has published the reporting on the funding allocation status for the CT bonds issued in FY 2023 on their website. JCR evaluates that the contents defined in this Framework are included and appropriate.[53]

[53] Japan Climate Transition Bonds Allocation Report for FY2023 Issuance
https://www.meti.go.jp/policy/energy_environment/global_warming/transition/climate.transition.bond.allocation.report.fy2023.eng.pdf

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

5. Organization's Sustainability Initiatives

Organization's Efforts on Environmental Issues This section evaluates whether the top officials involved in fundraising consider environmental issues as a critical priority for management, and if policies, processes, criteria for selecting eligible projects, etc., are clearly established through the setting up of a department specializing in environmental fields or through collaboration with external organizations.

▶▶▶ Current Status of Evaluation Targets and JCR's Evaluation

JCR confirmed that the Government of Japan has positioned the realization of a decarbonized society as one of Japan's key issues, has established laws concerning GX and decarbonization of power sources, and is addressing these as important priority matters for the country. Furthermore, in practice, under the initiative of the GX Implementation Council, led by the Prime Minister, a liaison meeting consisting of relevant government offices has been established, ensuring that the government as a whole is involved in these efforts. The working groups tasked with specifically examining the GX Implementation Council and the Sector-specific Investment Strategies involve inviting experts from academia, finance, and various industrial fields to create a structure that allows for multifaceted examination. This approach is highly valued.

For details on the current status of this evaluation subject, please refer to Chapter 2, sections 2.1 and 2.2 of this evaluation report.

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

Evaluation phase 3: Evaluation result(Conclusion)

Green 1(T)(F)

Based on its JCR Green Finance Evaluation Methodology, JCR assigned "gt1(F)" for the "Green and Transition Evaluation (Uses of Proceeds)" and "m1(F)" for the "Management, Operation and Transparency Evaluation." As a result, JCR assigned "Green 1(T)(F)" for the "JCR Climate Transition Finance Framework Evaluation." The Framework meets the standards for the items required in the Green Bond Principles, the Green Loan Principles, the Green Bond Guidelines, the Green Loan Guidelines and CTFH so forth.

		Management, Operation, and Transparency Evaluation				
		m1(F)	m2(F)	m3(F)	m4(F)	m5(F)
Green and Transition Evaluation	gt1(F)	Green 1(T)(F)	Green 2(T)(F)	Green 3(T)(F)	Green 4(T)(F)	Green 5(T)(F)
	gt2(F)	Green 2(T)(F)	Green 2(T)(F)	Green 3(T)(F)	Green 4(T)(F)	Green 5(T)(F)
	gt3(F)	Green 3(T)(F)	Green 3(T)(F)	Green 4(T)(F)	Green 5(T)(F)	Not qualified
	gt4(F)	Green 4(T)(F)	Green 4(T)(F)	Green 5(T)(F)	Not qualified	Not qualified
	gt5(F)	Green 5(T)(F)	Green 5(T)(F)	Not qualified	Not qualified	Not qualified

(Responsible analysts for this evaluation) Kosuke Kajiwara, Haruna Goto

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.

Important explanations of this Evaluation

1. Assumptions, Significance and Limitations of JCR Climate Transition Finance Framework Evaluation

   JCR Climate Transition Finance Framework Evaluation, which is determined and provided by Japan Credit Rating Agency, Ltd. (JCR), covers the policies set out in the Climate Transition Finance Framework, and expresses JCR's comprehensive opinion at this time regarding the appropriateness of the Green/Transition Project as defined by JCR and the extent of management, operation and transparency initiatives related to the use of funds and other matters. Therefore, JCR Climate Transition Finance Framework Evaluation is not intended to evaluate the effects of specific environmental improvements and the management, operation and transparency of individual bonds and borrowings, etc. to be implemented based on these policies. In the event an individual bond or individual borrowing based on this Framework is subject to a green/transition finance evaluation, a separate evaluation is needed. JCR Climate Transition Finance Framework Evaluation does not prove the environmental improvement effects of individual bonds or borrowings implemented under this Framework, and does not assume responsibility for their environmental improvement effects. JCR confirms the environmental improvement effects of funds procured under the Climate Transition Finance Framework measured quantitatively and qualitatively by the issuer/borrower or by a third party nominated by the issuer/borrower, but in principle it does not directly measure such effects.

2. Method used to conduct this evaluation

   The methodologies used in this assessment are described in "JCR Green Finance Evaluation" on the "Sustainable Finance ESG" section of the JCR website (https://www.jcr.co.jp/en).

3. Relationship with Acts Concerning Credit Rating Business

   JCR Climate Transition Finance Framework Evaluation is determined and provided by JCR as a related business, which is different from its activities related to the credit rating business.

4. Relationship with Credit Ratings

   The Evaluation is different from the Credit Rating and does not assure to provide or browse a predetermined credit rating.

5. Third-Party Evaluation of JCR Climate Transition Finance Framework Evaluation

   There are no capital and/or personnel relationships that may result in a conflict of interests between the subject of this evaluation and JCR.

■Matters of Attention

The information contained in this document was obtained by JCR from the issuer/borrower and from accurate and reliable sources; however, such information may be mistaken for human and/mechanical errors or other reasons. Therefore, JCR makes no representation or warranty, whether express or implied, as to the accuracy, result, appropriateness, timeliness, completeness, marketability or fittingness for any particular purpose of such information, and assumes no responsibility for any errors, omissions or consequences of using such information. JCR shall not be liable for any loss of opportunity and extraordinary, indirect, incidental or consequential damages of any kind, including any loss of money, which may result from any use of such information under any circumstances, whether contractual liability, tort liability, negligence or other causes of liability, and whether or not such damages are foreseeable or unforeseeable. JCR Climate Transition Finance Framework Evaluation does not express any opinion on various risks (credit risk, price fluctuation risk, market liquidity risk, price fluctuation risk, etc.) related to green/transition finance based on the transition finance framework, which is the target of the evaluation. Furthermore, it is an expression of JCR's opinion at the present time and does not represent facts nor does it make any recommendation regarding risk assessment or decisions on the purchase, sale or holding of individual bonds, commercial paper, etc. JCR Climate Transition Finance Framework Evaluation may be modified, suspended or withdrawn due to changes in information, lack of information or other reasons. All rights pertaining to this document, including data from JCR Climate Transition Finance Framework Evaluation, are held by JCR. All or part of this document, including data from JCR Climate Transition Finance Framework Evaluation, is prohibited from being reproduced, modified or otherwise altered without the permission of JCR.

■ Glossary

JCR Climate Transition Finance Framework Evaluation: This evaluates the extent to which the funds procured through Green/Transition Finance are appropriated for green/transition projects as defined by JCR and the degree to which the management, operation and transparency of the Green/Transition Finance are ensured. Evaluations based on a 5-point scale are given from top to bottom using the Green 1(T)(F), Green 2(T)(F), Green 3(T)(F), Green 4(T)(F), and Green 5(T)(F) symbols.

■ Status of Registration as an External Evaluator of Sustainability Finance

- Registered as an External Reviewer of Green Bonds by the Ministry of the Environment
- ICMA (registered as an observer with the Institute of International Capital Markets)

■ Status of registration as a credit rating agency, etc.

- Credit Rating Agency: the Commissioner of the Financial Services Agency (Rating) No.1
- EU Certified Credit Rating Agency
- NRSRO: JCR has registered with the following four of the five credit rating classes of the U.S. Securities and Exchange Commission's Nationally Recognized Statistical Rating Organization (NRSRO): (1) financial institutions, broker-dealers, (2) insurance companies, (3) general business corporations and (4) governments and municipalities. If the disclosure is subject to Section 17g-7 (a) of the Securities and Exchange Commission Rule, such disclosures are attached to the news releases appearing on the JCR website (https://www.jcr.co.jp/en/).

■For further information, contact

Information Service Dept. TEL: 03-3544-7013 FAX: 03-3544-7026

Japan Credit Rating Agency, Ltd.

Jiji Press Building, 5-15-8 Ginza, Chuo-ku, Tokyo 104-0061, Japan

Tel. +81 3 3544 7013, Fax. +81 3 3544 7026

Copyright © Japan Credit Rating Agency, Ltd. All rights reserved.

Copyright © Japan Credit Rating Agency, Ltd. All Rights Reserved.