23-D-1036
November 7, 2023

Japan Credit Rating Agency, Ltd. (JCR) announce the following Climate Transition Bond Framework Evaluation Results.

The Government of Japan

Japan Climate Transition Bond Framework　Assignment

Overall Evaluation	Greenness/ Transition 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. Overview of the Government of Japan

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 km^2, approximately 70 per cent of which is mountainous terrain that includes roughly 67 per cent of forests and it ranks 62nd in the world. Natural disasters, such as earthquakes or typhoons have hit Japan more often than the rest of the world. While the land area accounts for only about 0.29 per cent in the world, 18.5 per cent of earthquakes with a magnitude of six 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. The amount of damage that Japan suffered by natural disasters, including typhoons or earthquakes account for 17.5 per cent of the world; therefore, Japan is called as a disaster-prone country. Further

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

The Japanese GDP in 2022 ranked the third after the United States and China thanks to having a large number of globally competitive manufacturing companies. According to the 2023 White Paper on Manufacturing Industries[1], Japan has 825 major manufacturing items in 2020 of 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, such as electronics or automobiles, which are strength of the Japanese manufacturing industry.

The total amount of greenhouse gas (hereinafter referred to as "GHG")[2] emissions in Japan with the thriving manufacturing industry, was 1.17 billion tons-CO_{2e} as of FY 2021 that ranked the fifth largest in the world; however, the actual amount in FY 2021 was reduced by approximately 16.9 per cent from FY 2013. Of which, the total carbon dioxide (hereinafter referred to as "CO_2") emissions amounted to 1,064 million tons-CO_2 and 92.9 per cent of the emissions are resulting from energy use. The breakdown by sector is as follows: the energy transformation sector, 40.4 per cent; the industrial sector, 25.3 per cent; the transportation sector, 16.7 per cent; the commercial industry, etc. sectors, 5.6 per cent and the household sector, 4.8 per cent.

In Japan, the pollution problem became serious during the high economic growth periods in the 1960s and 1970s, and many measures were taken to prevent air pollution, which led to advanced efforts in the environmental sector. Legally binding numerical targets for emission reductions in developed countries were set out for six types of GHG - CO_2, methane, dinitrogen monoxide (nitrous oxide,) hydrofluorocarbons (HFC,) perfluorocarbons (PFC) and sulfur hexafluoride (SF6) and adopted as the "Kyoto Protocol" in the Kyoto Conference on Climate Change (COP3) held in Kyoto in 1997. In May 2023, “G7 Sapporo Climate, Energy and Environment Ministers’ Meeting” was held at G7 Hiroshima summit hosted by the Government of Japan. The Government of Japan has been aggressively leading the decarbonization initiatives with Japan’s established and newly developing technology to promote the green transformation (hereinafter referred to as "GX") that is a transformation of the entire economic and social system to the zero carbon emission economy by 2050 at the latest in order to keep a limit of 1.5 °C temperature rise within reach and enable climate resilient, circular, pollution-free, and nature positive economies, and to halt and reverse biodiversity loss by 2030, in an integrated manner, ensuring inclusive, socially and environmentally sustainable economic growth and development, and energy security.

[1] "The 2023 White Paper on Manufacturing Industries (Annual Report based on Article 8 of the Basic Act on the Promotion of Core Manufacturing Technology)"by the METI, Ministry of Health, Labor and Welfare, Ministry of Education, Culture, Sports, Science and Technology at https://www.meti.go.jp/report/whitepaper/mono/2023/index.html

[2] CO_2, methane, dinitrogen monoxide (nitrous oxide,) hydrofluorocarbons (HFC,) perfluorocarbons (PFC) and sulfur hexafluoride (SF6)

2. Overview of the Transition Strategy

The Government of Japan declared "2050 carbon neutral" in October 2020, based on the goals set out in the Paris Agreement (substantially reduce global greenhouse gas emissions to hold global temperature increase to well below 2°C above pre-industrial levels and pursue efforts to limit it to 1.5°C above pre-industrial levels,) and legalized it by amending the Act on Promotion of Global Warming Countermeasures in 2021. In April 2021, the government expressed that it aimed to reduce GHG by 46 per cent (from FY 2013) in FY 2030 and continuingly challenge to realize 50 per cent reduction as an interim goal for carbon neutral in 2050.

As mentioned above, energy-derived CO_2 accounts for a little under 90 per cent of total GHG emissions of Japan. It is therefore significant to steadily take concrete measures for decarbonization in the industry, business, transportation and household sectors, based on the national energy basic plan and the national energy mix to achieve the 2030 target. The Government of Japan launched GX that is to transform the industrial and social structures from fossil energy-centered since the Industrial Revolution into clean energy-centered in the 6th Strategic Energy Plan decided in the cabinet in October 2021. The government has held the GX Implementation Council, chaired by the Prime Minister and composed of experts from the government, private sector experts and academia since 2023 and compiled Basic Policy for the Realization of GX. The GX Promotion Act and the GX Decarbonization Electricity Act were enacted in 2023, and a system to promote the initiatives toward "Growth-oriented Carbon Pricing (CP) Concepts" was established. "GX Promotion Strategy" was decided in the cabinet in July 2023, based on the GX Promotion Law as a concrete strategy for implementing a series of policies.

The government centered to seek for further energy consumption reduction and for making renewable energy the main power sources as its first prioritized strategy. It then supports to realize the development of next-generation technologies in 22 sectors, including, but not limited to, the maximum utilization of nuclear power or hydrogen/ammonia/carbon recycling.

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

The government's transition strategies and specific policies satisfy the four elements of the Climate Transition Finance Handbook[3] and the Basic Guidelines on Climate Transition Finance[4] (hereinafter collectively referred to as "CTFH".) JCR has evaluated the Japan's transition strategies as highly ambitious since the initiatives needs additional huge investment with the followings: the strategies include a plan to attract 150 trillion yen from both public and private sectors for the next 10 years to achieve carbon neutral in 2050 and the interim milestone in 2030 (a 46 per

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

[4] "Basic Guidelines for Climate Transition Finance 2021 Edition"provided by Financial Services Agency, the METI, Ministry of the Environment at https://www.meti.go.jp/policy/energy_environment/global_warming/transition/basic_guidelines_on_climate_transition_finance_eng.pdf

cent reduction from FY 2013.) Ahead of that, the government decided to implement GX related investment by issuing climate transition bonds set out in this framework.

The goal established by the Government of Japan is align with the target in the Paris Agreement (aiming to limit global warming ideally to 1.5°C and to well below 2°C). Although the target falls under Scope 3 for the government and a clear level of 1.5°C alignment of sovereign case is not shown globally as a scientific basis, JCR found that the Japan's 2030 target is relatively ambitious than most of other G7 countries.

▶▶▶ 4. Outline of Climate Transition Finance Framework Evaluation

This evaluation target is Japan Climate Transition Bond Framework (hereinafter referred to as "this framework",) which was established to restrict the proceeds financed through GX Economy Transition Bonds for use with environmental benefits. JCR evaluates whether this framework aligns with the Green Bond Principles[5], the Green Bond Guidelines[6] and CTFH. JCR will evaluate them by referring to the Principles and Guidelines as the present domestic/international unified standard although these are principles or guidelines and are not regulations legally authorized.

The Government of Japan has set out the use of proceeds in this framework as research and development (hereinafter referred to as "R & D") funds or subsidy programs for projects that are in the sector set forth in the GX Promotion Strategy as measures that contribute to Japan's GX and that meet the basic conditions established in the GX Promotion Strategy. The negative impacts on the environment and society will be confirmed when evaluating/selecting individual eligibility project although many eligible projects are R & D funds and subsidy programs and are unlikely to have direct severe negative impacts on the environment and society. Accordingly, it is expected that the use of proceeds in this framework will promote the Japanese entire GX and contribute to achieving the 2050 carbon neutral and its milestone, the 2030 goals.

In the process of selecting projects set out in this framework by the government include (1) a liaison system between relevant ministries and agencies has been established; (2) the selection is to be finally approved in the GX Implementation Council haired by the Prime Minister; (3) bonds to be issued, based on this framework are managed separately from other accounts in the energy supply and demand account of the special account for energy measures and (4) allocated projects are separately categorized as GX-related budgets in the same account. JCR therefore has evaluated that a system has been established to properly classify and manage proceeds financed, based on this framework. JCR has also confirmed that reporting contents/periods on the allocation of proceeds and impacts are adequately established.

[5] "Green Bond Principles 2021" provided by International Capital Market Association (ICMA) at https://www.icmagroup.org/green-social-and-sustainability-bonds/green-bond-principles-gbp/
[6] "Green Bond Guidelines 2022 Edition" provided by Ministry of the Environment at https://www.env.go.jp/content/000062495.pdf

Accordingly, JCR has evaluated that the management and operation system in the national government has been established and has transparency.

JCR assigned "gt1(F)" for "Greenness/Transition Evaluation (Use of Proceeds),and "m1(F)" to the "Management, Operation and Transparency Evaluation." As a result, JCR assigned "Green 1(T)(F)" to the overall "JCR Climate Transition Bond Framework Evaluation." JCR has evaluated that this framework satisfies the criteria for items required in the "Green Bond Principles," "Green Bond Guidelines," and CTFH.

Table of Contents

Chapter 1: Overview of Evaluation Targets

This evaluation target is Climate Transition Bond Framework prepared by the Government of Japan.

The use of the proceeds financed will be allocated to the projects, aiming to realize the 2050 carbon neutral that is an international commitment aligned with the Paris Agreement and a 46 per cent reduction in FY 2030 (from FY 2013) based on the "Strategy for Promoting Transition to a Decarbonized, Growth-Oriented Economic Structure (known as GX Promotion Strategy)."

The proceeds shall be selected from the measures/projects stipulated "GX Promotion Strategy" and it will be repaid from by several conditions, since future carbon pricing ("CP" refers to charge for fossil fuels and expenses borne by specified business in the electricity sector) as financial resources: 1) it shall be taken into account the balance between benefits and burdens of citizens, 2) the investment decision is difficult for the private sector while considering the benefits and burdens perspectives and 3) it shall be prioritized to the investment area which will contribute to realize both emission reduction and industrial competitiveness strengthening and economic development of Japan.

The government considers to support high emission companies which participate in emission trading system called "GX League[7]". So the implementing bodies of the use of proceeds shall be selected fromt those companies.

The "GX Promotion Strategy" listed 14 future action for efforts as exemplified in the "Decarbonization initiatives for GX on the premise of ensuring a stable energy supply" that promote toward decarbonization by the public and private sectors and these measures are classified as shown in Table 1. These efforts will be organized as eligible criteria for climate transition bonds hereafter, some of which may fall under more than one categories, such as promoting energy conservation.

Table 1: Concept of eligible criteria category based on energy supply and demand[8]

Category of Energy Supply and Demand	Type of Division	Eligible Criteria
Energy Supply Side	GX in Energy Transition Division	- Making renewable energy a major power source - Utilization of nuclear power - Facilitating introduction of hydrogen and ammonia - Establish electricity and gas markets to achieve carbon neutrality - Battery industry

[7] GX is an abbreviation for Green Transformation, which refers to the transformation and activities aimed at achieving this goal by utilizing clean energy while avoiding the use of fossil fuels as much as possible.The GX League is a group of companies that are actively working on GX, together with players from the government, academia, and finance who are taking on the challenge of GX, to discuss reforming the entire economic and social system and creating new markets. It was established by the Ministry of Economy, Trade and Industry as a place to practice creativity.

[8] Source: This framework

Energy Demand Side	GX of Life related Division	- Promotion of thorough energy efficiency improvement and restructuring the manufacturing industry (through fuel and feedstocks transition) - Battery industry - GX in transport sector - Digital investment aimed at decarbonization - Houses and buildings - Infrastructure
	GX in the Industrial Sector	- Promotion of thorough energy efficiency improvement and restructuring the manufacturing industry (through fuel and feedstocks transition) - Facilitating introduction of hydrogen and ammonia Battery industry - Resource circulation - GX in transport sector - Digital investment aimed at decarbonization - Houses and buildings - Infrastructure - Carbon Recycling andCCS - Food, agriculture, forestry and fisheries industry

The use of proceeds financed in this framework shall satisfy "basic conditions" in Table 2 and selected from the category listed in Table 1.

Table 2: GX Economy Transition Bond "basic conditions" in the selection of the use of proceeds (overview) [9]

Basic Conditions	
I.	Efforts that are truly difficult to make investment decisions solely by the private sector
II.	Efforts that contribute to strengthening industrial competitiveness, economic growth and emission reduction, which are essential for achieving GX
III.	Integration with regulations and institutional measures that change corporate investment and demand-side behavior
IV.	Efforts that contribute to the expansion of domestic investment including for human capital

The government prioritizes projects that align with the types which meet each of the requirements from A to C for increasing industrial competitiveness/economic growth and the requirements from 1 to 3 for emission reduction as candidates subject to support in addition to the aforementioned principles.

[9] Source: This framework

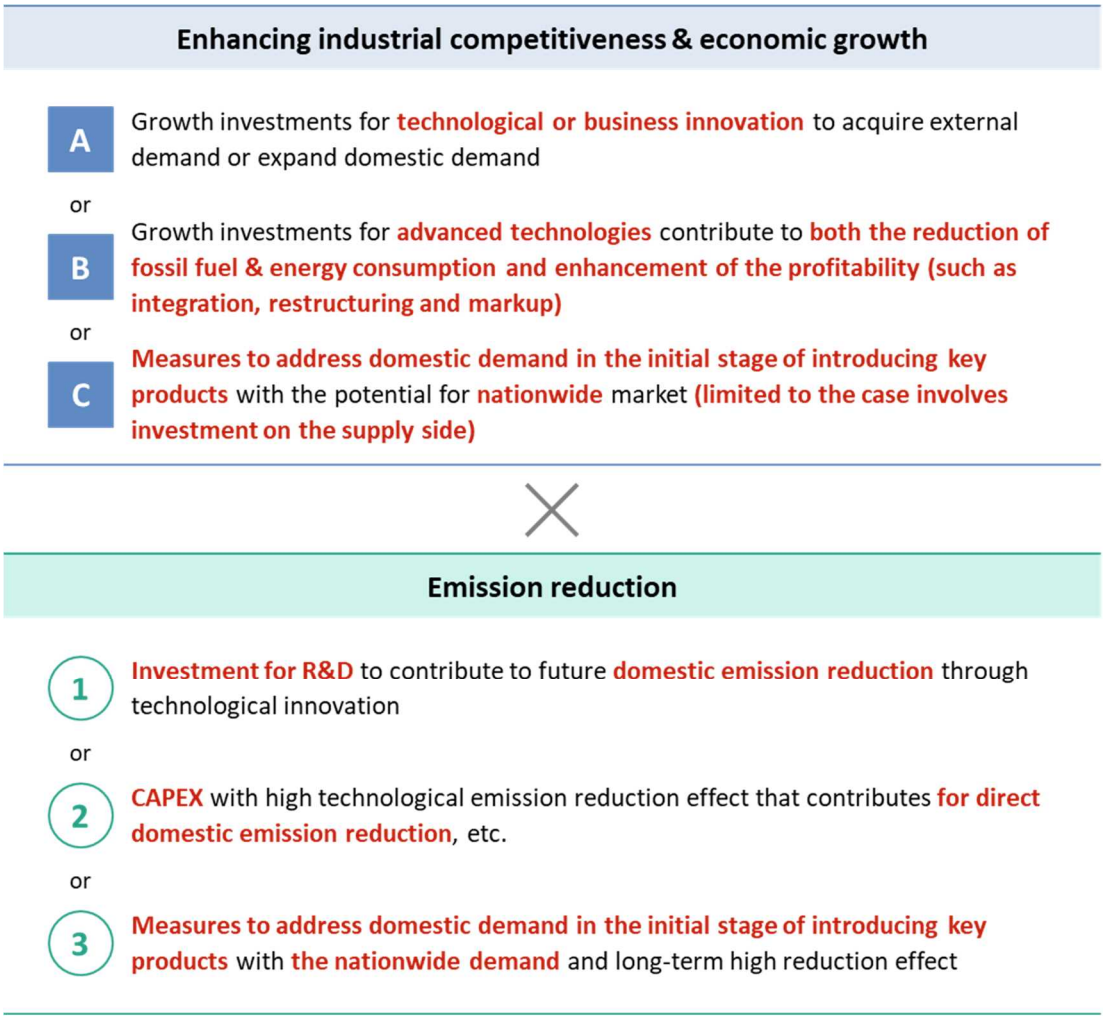


Figure 1: Requirements for selecting the use of proceeds for GX economic transition bonds[10]

JCR evaluates the alignment of this framework with the Green Bond Principles, such as CTFH and the Green Bond Guidelines of the Ministry of the Environment, based on JCR Green Finance Evaluation Methodology in the next chapter in detail.

[10] Source: This framework

Chapter 2: Alignment with Climate Transition Finance Handbook

2-1. Japan's Economic Policy and Transition Strategy

<Outline/Political/Social Situations>

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 km^2, 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. The amount of damage that Japan has suffered by natural disasters, including typhoons or earthquakes accounts for 17.5 per cent of the world; therefore, Japan is called as a disaster-prone country. 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.

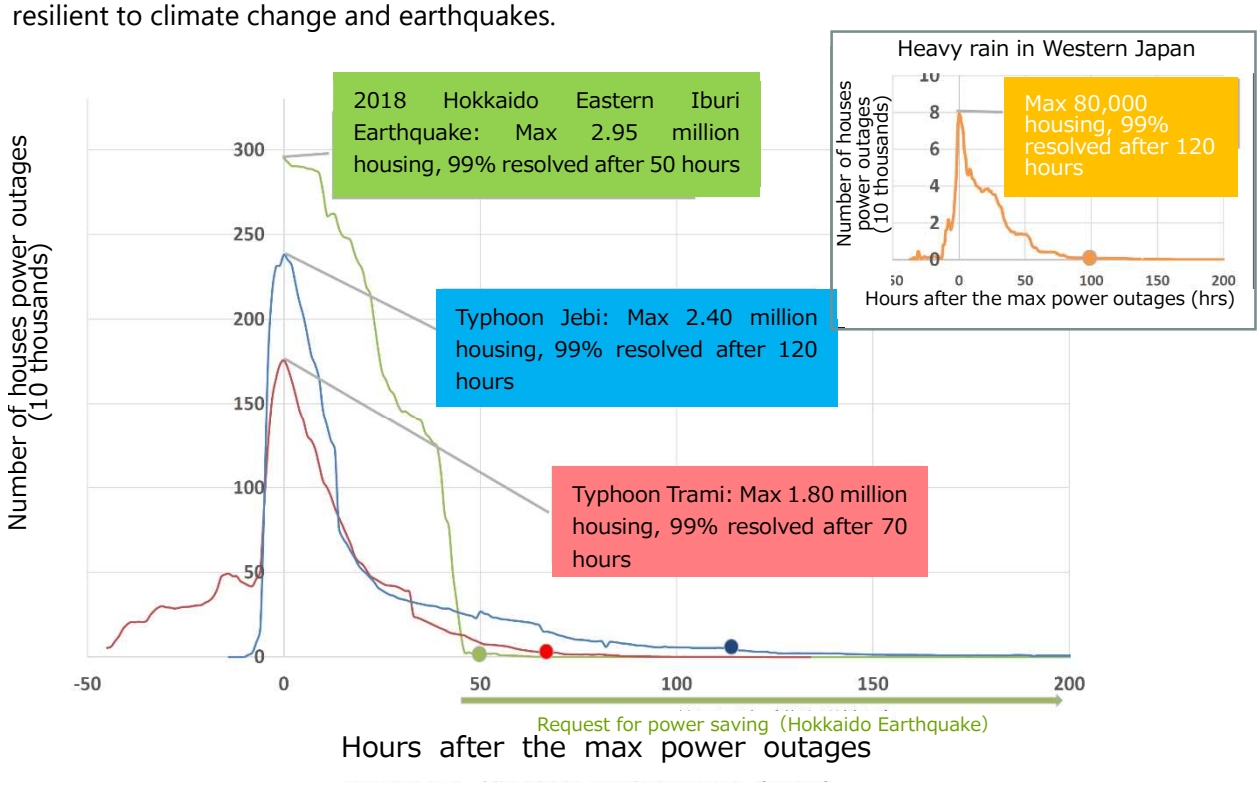
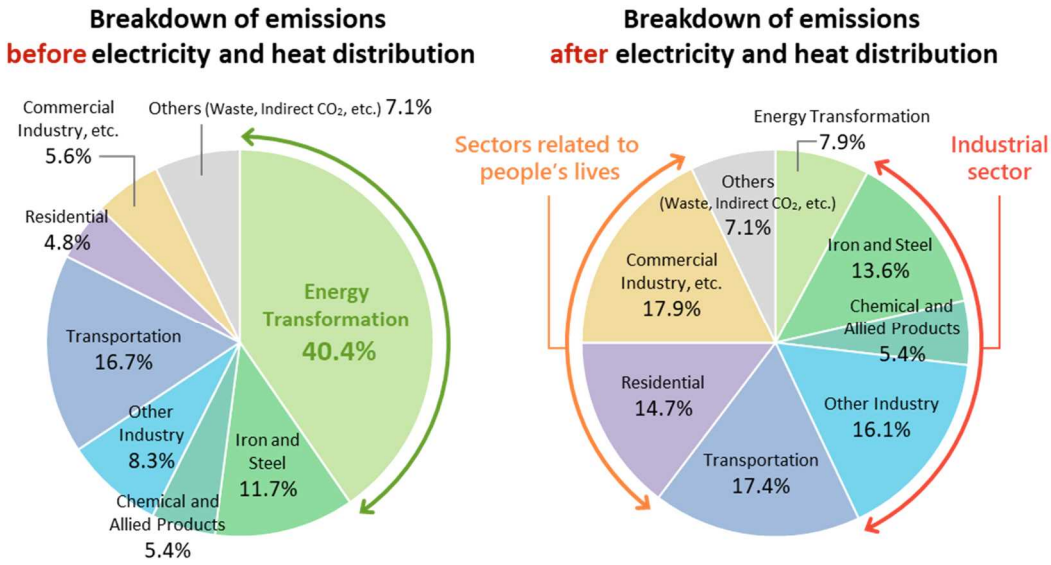


Figure 2: The number of power outages and time taken to resolve in each disaster[11]

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

The Japanese GDP in 2022 ranked third after the United States and China 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 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 1.17 billion tons-CO_{2e} as of FY 2021, ranked the fifth largest in the world; however, the actual amount in FY 2021 was reduced by approximately 16.9 per cent from FY 2013. Of which, the total CO_2 emissions amounted to 1,064 million tons-CO_2, and 92.9 per cent of the emissions are resulting from energy use. The breakdown by sector is as follows: the energy transformation sector, 40.4 per cent; the industrial sector (the iron and steel, chemical and allied products and other industry), 25.3 per cent; the transportation sector, 16.7 per cent; the commercial industry, etc. sectors, 5.6 per cent and the household sector, 4.8 per cent (Figure 3, before electricity and heat distribution.)



Source: Japan National Institute for Environmental Studies (based on emissions in the fiscal year 2021)

Figure 3: Breakdown of CO_2 emissions by sector (Final figures for FY 2021)[12]

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

[12] The outline of the 2021 Greenhouse Gas Emissions/Absorption (Final Figures) by National Institute for Environmental Studies under the jurisdiction of Ministry of the Environment

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 by 2030 in the "G7 Sapporo Climate, Energy and Environment Ministers' Meeting" as its host country in the G7 Hiroshima Summit in May 2023.

<Plan for Global Warming Countermeasures>

The Government of Japan established 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) and set out the basic principles for promoting global warming countermeasures, such as realizing decarbonized society for the 2050 Carbon neutral, 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. The goal of reducing GHG by 46 per cent in FY 2030 from FY 2013 as an interim target was announced, adding its challenge continues to further reduce by 50 per cent in the Plan for Global Warming Countermeasures revised in October 2022, based on the revised Act on Promotion of Global Warming Countermeasures.

The transition of GHG emissions in Japan, which is the premise of the plan, is shown in Figures 4 and 5, respectively. The total GHG emissions amounted to 1.170 billion t-CO_{2e} in FY 2021, decreased by roughly 16.9 per cent (238 million t-CO_{2e}) from FY 2013 (1.408 billion t-CO_{2e}.)

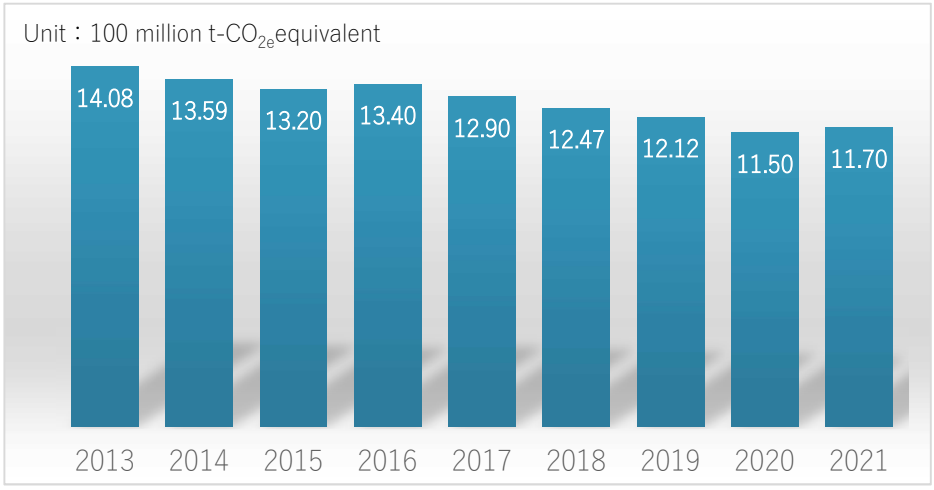


Figure 4: Changes in Japan's total GHG emissions[13]

[13] Created by JCR based on the Plan for Global Warming Countermeasures (in October 2021) materials provided by Ministry of the Environment

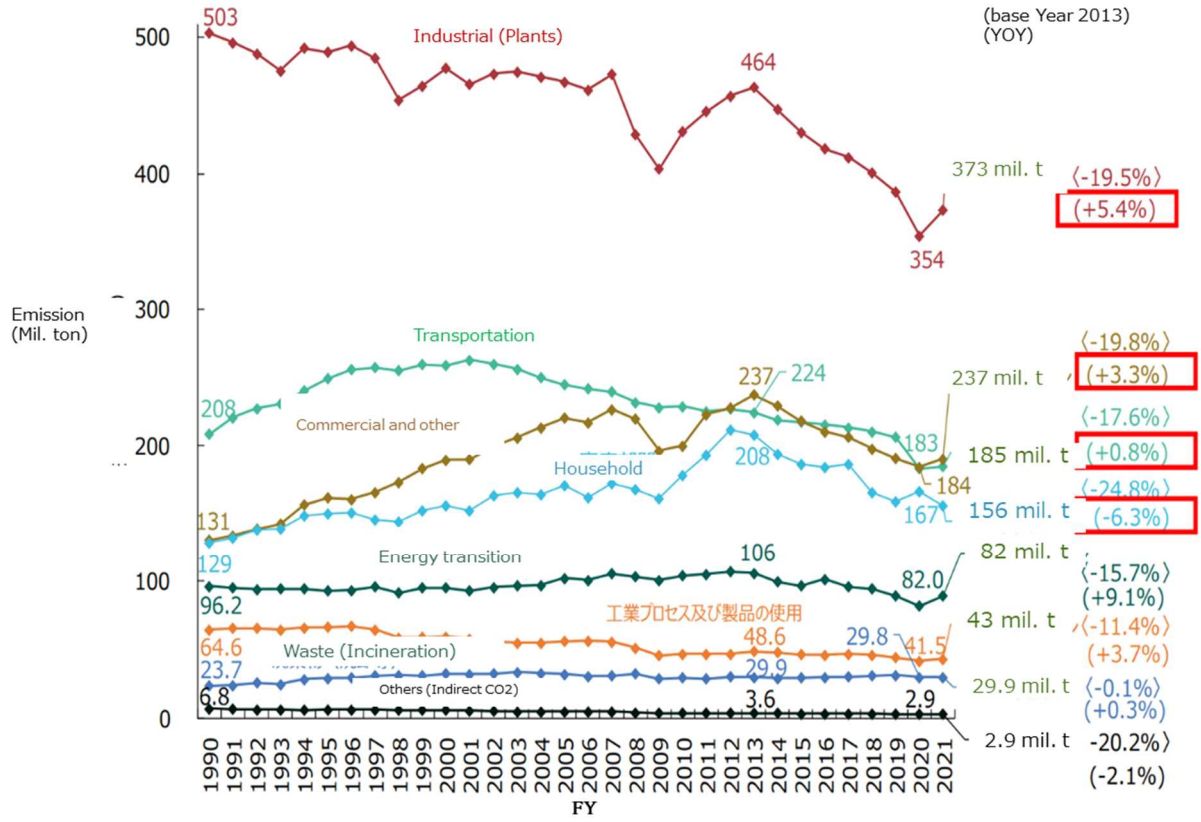


Figure 5: Trends in Japan's CO_2 Emissions by Sector[14]

The reduction targets were established for FY 2030 by GHG and by division for energy-derived CO_2 in the Plan for Global Warming Countermeasures (see Figure 6.) 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.

[14] The outline of the 2021 Greenhouse Gas Emissions/Absorption (Final Figures) by National Institute for Environmental Studies under the jurisdiction of Ministry of the Environment

(Unit: Mil. t-CO2, (Base year 2013 comparison))

	FY2013	FY2019	FY2030
GHG emission/absorption	1,408	1,166 (▲17%)	760 (▲46%)
Energy oriented CO_2	1,235	1,029 (▲17%)	677 (▲45%)
Industry	463	384 (▲17%)	289 (▲38%)
Busines and others	238	193 (▲19%)	116 (▲51%)
Household	208	159 (▲23%)	70 (▲66%)
Transport	224	206 (▲8%)	146 (▲35%)
Energy transition	106	89.3 (▲16%)	56 (▲47%)
Non Energy oriented CO_2	82.3	79.2 (▲4%)	70.0 (▲15%)
CH_4	30.0	28.4 (▲5%)	26.7 (▲11%)
N_2O	21.4	19.8 (▲8%)	17.8 (▲17%)
Alternative	39.1	55.4 (+42%)	21.8 (▲44%)
HFCs	32.1	49.7 (+55%)	14.5 (▲55%)
PFCs	3.3	3.4 (+4%)	4.2 (+26%)
SF_6	2.1	2.0 (▲4%)	2.7 (+27%)
NF_3	1.6	0.26 (▲84%)	0.5 (▲70%)
GHG absorption source	-	▲45.9	▲47.7
Bilateral credit system (JCM)	0.1 billion t-Co2 reduction		

Figure 6: Japan's GHG Emission Reduction Targets and guidelines by GHG and other categories[15]

<Strategy for Promoting Transition to Decarbonized Growth-Oriented Economic Structure>

As shown in Figure 6 above, energy-derived CO_2 accounts for a little under 90 per cent of GHG emissions in Japan. It is therefore important to steadily take concrete measures for decarbonization in the industry, business, transportation and household sectors, based on the national energy basic plan and energy mix in order to achieve the 2030 target. The Government of Japan launched " GX" that is to transform the industrial and social structures mainly from fossil energy-centered since the Industrial Revolution into clean energy-centered in the 6th Strategic Energy Plan, decided in the cabinet in October 2021. The government has held the GX Implementation Council, chaired by the Prime Minister and composed of experts from the

[15] Sourse: "Plan for Global Warming Countermeasures" decided in the cabinet in October 22, 2021 at https://www.env.go.jp/content/900440195.pdf

government, private sectors and academia since 2023 and compiled "the Basic Policy for the Realization of GX." The GX Promotion Act and the GX Decarbonized Power Supply Act were enacted in 2023, and a system to promote initiatives toward "Pro-Growth Carbon Pricing Concept" was established. "GX Promotion Strategy" was decided in the cabinet in July 2023, based on the GX Promotion Act as a concrete strategy for implementing a series of policies.

Table 3: Overview of GX Promotion Strategy[16]

(1) GX initiatives based on the premise of ensuring a stable energy supply	(2) Realization and implementation of the "Pro-Growth Carbon PricingConcept" and other initiatives
1. Promotion of thorough energy efficiency improvement ・ Energy saving support for small- and medium-sized enterprises ・ Housing energy saving support ・ Conversion to non-fossil energy and further energy saving support in five major industries (steel, chemical, cement, paper and automobile) 2. Making renewable energy a mainstay power source ・ Accelerating maintaining grids and realizing revised direct current (DC) transmission from Hokkaido ・ Introducing renewable energy in harmony with the community, social implementation of next generation solar power (Perovskite) and floating offshore wind power 3. Utilization of nuclear power ・ Materializing next-generation innovation reactors ・ Securing an operation period of 40 years + 20 years and additional extension on the premise of strict safety inspection ・ Increasing efforts for nuclear fuel cycles/ decommissioning and final disposal 4. Other important matters ・ Constructing hydrogen/ammonia supply chains ・ Introducing decarbonization power supply auction ・ Strategically securing surplus LNG ・ R & D, capital expenditures and demand creation for GX, such as carbon recycling, storage batteries, resource recycling, next-generation automobiles/ aircraft or zero-emission ships	To realize GX investments with over 150 trillion yen by public and private sectors for the next 10 years. 1. Upfront Investment support utilizing GX Economy Transition Bonds ・ Support up-front investment of 20 trillion yen for the next 10 years 2. GX investment incentives through "Pro-Growth Carbon Pricing Concept" <Specific example> i) Full-scale operations of the emissions trading scheme (in and after FY 2026) ii) Introducing a carbon tax system for fossil fuels importers (in and after FY 2028) * GX Promotion Organization was established as the aforementioned implementing body 3. Utilization of new financial instruments ・ GX Promotion Organization considers/implements risk supplement measures, such as debt guarantee ・ Environment development to promote sustainable finance 4. International strategy, Just Transitions, and GX of small and medium enterprises (SMEs) and other businesses ・ Asia Zero Emission Community Initiatives ・ Promoting smooth labor mobility ・ Stimulating demand for decarbonized products ・ Promoting efforts throughout the supply chains, including SMEs, such as human resources development during the SME support period for push-type support
(3) Progress Evaluation and Necessary Reviews: Progress evaluation will be regularly conducted, based on the impacts on the progress of GX investments, global trends and economy.	

The GX Promotion Strategy highly prioritize energy conservation and introducing as much renewable energy as possible as a main power source, After doing the prioritized policy above, the government supplements the rest of the electricity demands which cannot be covered by renewable energys by next-generation clean energy such as hydrogen, ammonia and synthetic fuels as well as nuclear power to realize zero carbon emission society. It also includes resources recycling and other important measures. All of these measures are based on technical grounds, and the combinations of technologies assumed in each cross section by FY 2023, FY 2030, FY 2040 and FY 2050 are compiled as "Future milestones" for all 22 categories. CO_2 reduction effects,

[16] Summarized/prepares by JCR based on disclosure materials provided by METI.

economic rationality and probability of social implementation in the sectoral investment strategies for the next 10 years and the action plan with a five-year lead will be discussed per sector by experts with academics invited and will be eventually decided in the GX Implementation Council, chaired by the Prime Minister as for concrete projects for the measures set forth in these Pathway.

The "Future milestones" is aligned with the sectoral technology roadmaps (hereinafter referred to as "sectoral roadmap") formulated by the METI. The sectoral roadmaps have been prepared sequentially since FY 2021 for industries with relatively large CO_2 emissions, such as steel, chemicals, electric power, gas, oil, paper and pulp, cement or automobiles. Low-carbon/decarbonized technologies for achieving the 2050 carbon neutral to be sectorally used are comprehensively covered, including the existing/future technologies that will be developed, aiming at social implementation and the routes are shown so as to align with the 2030 goals to limit to keep the global temperature rise well below 2 °C and to pursue efforts to limit the temperature increase even further to 1.5 °C and to achieve the 2050 carbon neutral with the combination of these technologies.

<Materiality of Decarbonization Transition Strategies in Japan>

The Government of Japan has positioned the GX initiatives as important measures that will contribute to the re-increasing Japanese industrial competitiveness by ensuring a stable supply of clean energy and creating new demand and markets in the decarbonization sector through shifting from the industrial and social structures on fossil energy-centered since the Industrial Revolution to clean energy-centered. Acceleration of GX and DX etc. is positioned as one of the five pillars for increasing investments and implementing economic and social reforms to accelerate new capitalism in the "Basic Policy on Economic and Fiscal Management and Reform 2023" and "Grand Design and Action Plan for a New Form of Capitalism."

Table 4: Framework of Basic Policies for Economic and Fiscal Management and Reform for 2023[17]

<table>
<tr><td colspan="2">I. Basic Views on Macroeconomic Management
Proceed with bold reforms to overcome the historical and structural changes and challenges facing Japan, both internal and external, which may be referred to as “turning points in the times.”</td></tr>
<tr><td>II. An Accelerating New Form of Capitalism
Realization of structural wage increases through the trinity labor market reforms, and strengthening investment in people, and creating a substantial middle class
Drastic strengthening of measures to copewith the declining birthrate and child policy
Expanding investment and implementing economic and social reforms
1. Increasing domestic investment and strengthening supply chains through public-private partnerships</td><td>III. Responding to the Environment Changes Surrounding Japan
Responding to changes in the international environment
Disaster prevention and mitigation, national resilience, reconstruction from the Great East Japan Earthquake, etc.
Safety and security of people's lives</td></tr>
</table>

[17] Prepared by JCR, based on the website of Cabinet Office, Basic Policy on Economic and Fiscal Management and Reform 2023 https://www5.cao.go.jp/keizai-shimon/kaigi/cabinet/honebuto/2023/summary_en.pdf

2. Acceleration of GX, DX etc. 3. Driving Startups and Converting to New Industrial Structure Promoting Impact Investment 4. Promoting Science, Technology and Innovation through Public-Private Partnerships 5. Deploying Inbound Strategies Creation of an inclusive society Revitalization of local communities and small businesses	
IV. Medium- and Long-Term Economic and Fiscal Management	V. Policy for Near-term Economic and Fiscal Management and FY2024 Budget Formulation

<Governance>

The directions of policies for GX implementation will be decided in the GX Implementation Council, chaired by the Prime Minister, with relevant ministers and experts participated. The Council includes experts in the industrial and financial sectors. The Cabinet Secretariat GX Office include officials sent from the Financial Services Agency, the Ministry of Foreign Affairs, the Ministry of Finance, the Ministry of Health, Labor and Welfare, the Ministry of Agriculture, Forestry and Fisheries, the METI, the Ministry of Land, Infrastructure, Transport and Tourism and the Ministry of the Environment, and they will compile proposals, including investment promotion measures of relevant ministries and agencies and will submit the sectoral investment strategical proposals, based on considerations in the working group with external experts to the GX Implementation Council.

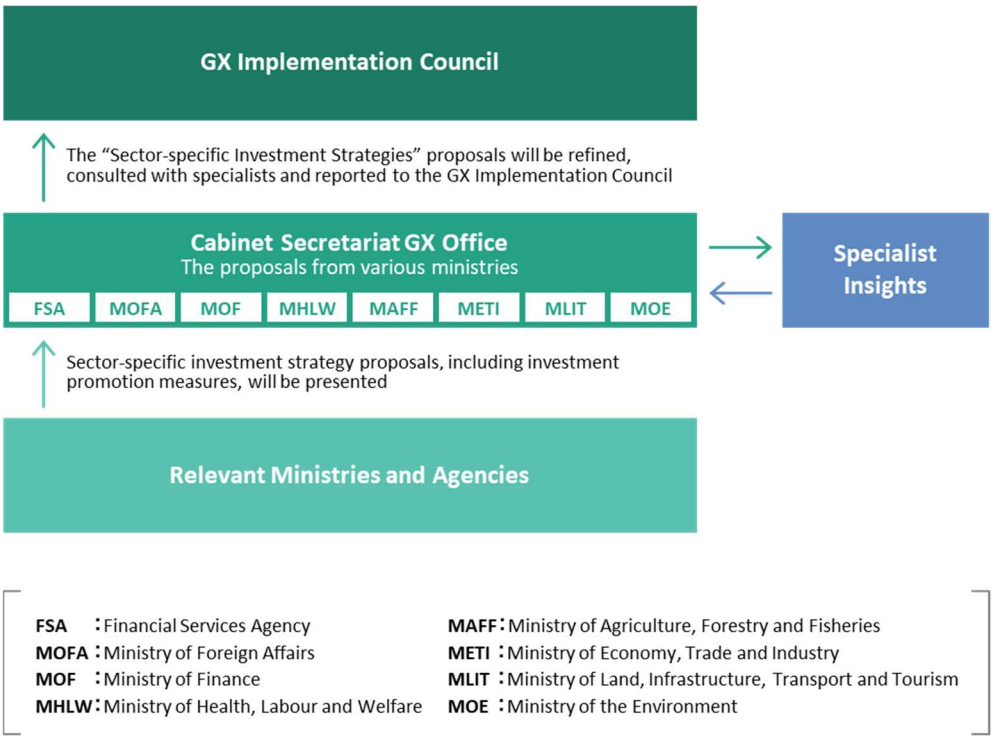


Figure 7: Governance Structure[18]

[18] Source: This framework

The current status/measures of GHG emissions/absorptions will be approved in the Global Warming Prevention Headquarters, in which all ministers annually participate, and then the plan will be updated/promoted as necessary from the viewpoint of measuring the effects of the aforementioned investment strategies.

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

Element 1: Issuer's climate transition strategy and governance

(1) Does the issuer have a transition strategy for climate change mitigation?

The Government of Japan has clarified that it aims to achieve the 2050 carbon neutral for which it will take necessary measures in the Act on Promotion of Global Warming Countermeasures. The government set the 2030 target (a 46 per cent reduction from FY 2013) to align with the target agreed in the Paris Agreement and established the reduction target per emission source for FY 2030 from FY 2013 in the Plan for Global Warming Countermeasures revised in 2021.

Specific measures toward the aforementioned goals are compiled in the GX Promotion Strategy (see Table 3 above.) The top priority is to thoroughly promote energy conservation and to make renewable energy main power source as specific initiatives to be undertaken by the Government of Japan, and then it aims to achieve its goals by supporting in respective sectors so as to implement/achieve next-generation technologies/developments, such as the utilization of nuclear power or hydrogen/ammonia/carbon recycling in the 22 sectors.

Accordingly, the national government has strategies for transitioning to mitigate climate change.

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

The Government of Japan published the Basic Guidelines on Climate Transition Finance in May 2021, shortly after the first edition of CTFH was published by ICMA in December 2020. This basic guideline aims to encourage efforts to steadily reduce carbon emissions, such as energy saving in sectors where is difficult to reduce emissions or to accelerate the innovation that contributes to transitions, including long-term R & D for decarbonization. The Guideline was formulated to achieve carbon neutral in 2050 in Japan and to contribute to realizing the goals of the Paris Agreement in order to establish the position as a financing tool for transition, in particular, in the sector where is difficult to reduce emissions and to use more proceeds by early disseminating climate transition finance and by ensuring the credibility when financing proceeds under the name of transition finance.

This framework was formulated in accordance with the CTFH and its Basic Guidelines, and is intended to contribute to realizing the strategies to shift to a business model by which Japan as a whole is contributable to achieving the goals of the Paris Agreement.

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

The Government of Japan, as mentioned above, will invite relevant ministries, external academics and experts in respective sectors required for GX, will eventually formulate the transition strategy in the GX Implementation Council, chaired by the Prime Minister based on necessary discussions, will report the subsequent progress to the Council and will review them as needed.

Accordingly JCR has evaluated that the Government of Japan has established a system to steadily implement the transition strategy.

Element 2: Business model environmental materiality

Japan's GHG emissions are the fifth largest in the world, and it is expected for Japan to lead the international community to initiatively limit the global temperature rise to the level set by the Paris Agreement. Taking into account that carbon prices will be introduced domestically and internationally hereafter, it is urgent to realize carbon-neutral society, to decarbonize various types of products stipulated by the GX Promotion Law and to change the structure of each business type while many manufacturing industries that is internationally competitive continuously maintain good performance. Under these circumstances, the Government of Japan presented a "Grand Design and Action Plan for a New Form of Capitalism" in June 2023 in which GX in Japan is expected to contribute to re-increasing the industrial competitiveness by making the best use of its knowledge in these sectors and to accelerating the transition to the decarbonization in the country as a whole since there are many research decarbonization technologies in which Japanese companies have technological strength.

Accordingly, JCR has evaluated that the Government of Japan's efforts to achieve carbon neutral in GX are one of the most important issues for Japan.

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

Does the transition roadmap meet the followings?

(1) The roadmap is quantitatively measurable and the target covers Scope 1 and Scope 2, respectively (it is desirable that the Scope 3 target be set to the extent feasible.)

As shown in the Plan for Global Warming Counteremasures, Japan's GHG emission reduction target is aligned with the goals of the Paris Agreement, which are science based targets agreed upon by the international community; specifically, to limit the global temperature increase to well below 2 °C. JCR has examined this factor according to the definition established by PCAF[19] since the Government of Japan does not use the concept of Scope 1, Scope 2 and Scope 3 for

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

the total amount of emissions. Assuming that the direct business activities of Government of Japan are Scope 1 and Scope 2, the target setting and specific measures are planned for reducing the emission from the central government's administration activities. The total emissions of Japan as a whole, which is equivalent to those of Scope 3 are disclosed in the Plan for Global Warming Countermeasures, by emission sources and by sectors as described in Figure 6 of this report.

Accordingly, the Government of Japan's plan appropriately covers the target scopes. And both the emission reduction results and mid target are disclosed, which shows Japan's transition plan's high transparency.

(2) Whether the GHG emission reduction target aligns with globally recognized science based target or not

The target set by the Government of Japan was established in 2021 on the premise of achieving the global temperature rise well below 2 °C declared in the Paris Agreement. The sectorial roadmaps which were formulated especially for high GHG emitted industries to achieve net zero emission by 2050, align with the IEA[20]'s NZE scenario[21] and SDS scenario[22]. The sectoral pathway were also taken into consideration of the possible menu of the current and future carbon reduction technologies.

The target formulated by the Government of Japan (a reduction rate, 2.7 per cent per year) is set to align with the 1.5 °C level shown in the IPCC[23]'s 1.5 °C Special Report[24] (a 45 per cent reduction by 2030 from the 2010 level; a reduction rate of 2.25 per cent per year.) Consequently, JCR has evaluated that the government targets is aligned with the target established, based on scientific grounds.[25]

[20]IEA: International Energy Agency
[21]Net Zero Emissions by 2050 Scenario by IEA
[22]Sustainable Development Scenario (Sustainable Development Scenario), which is the path to fully achieve the sustainable development goals by the IEA
[23]IPCC: Intergovernmental Panel on Climate Change
[24]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
[25]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.

For reference, the figure below shows the relative ambition level of goal setting compared to that of other countries.

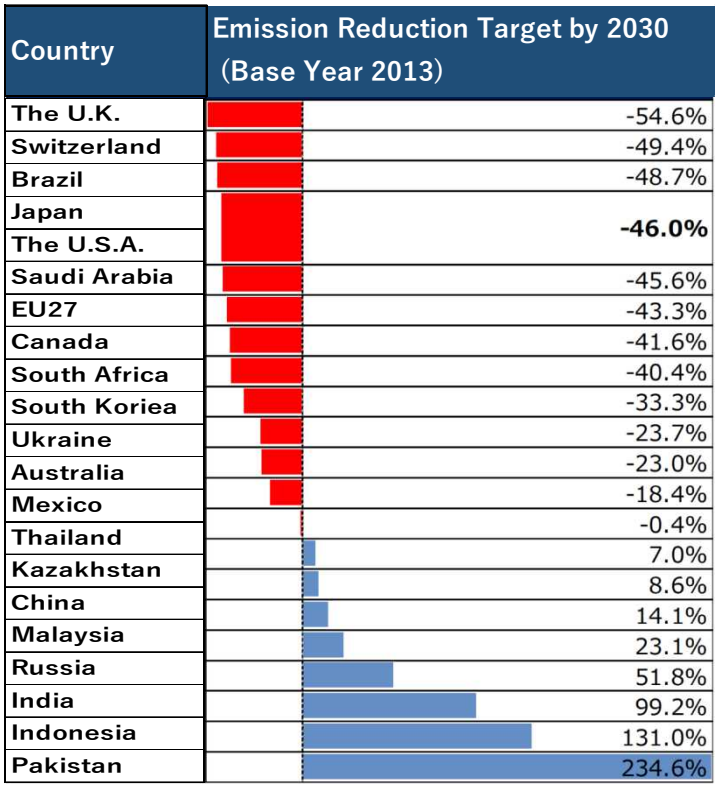


Figure 8: GHG emission reduction rate target for FY 2030 (comparison when each country's target is replaced with figures based on the 2013 standard)[26]

(3) Details must be publicly disclosed (including intermediate milestones)

The goal of the Government of Japan to achieve carbon neutral in 2050 is clearly stated in the Act on Promotion of Global Warming Countermeasures. The goal of reducing the total GHG emissions by 46 per cent from FY 2013 in FY 2030 was announced in the Plan for Global Warming Countermeasures as an interim target, and it is also added that the challenge will continue, aiming for a higher goal, a 50 per cent reduction. Furthermore, the 2030 targets per emission source are disclosed in the plan, which is highly transparent.

(4) Certified/verified by an independent third party

The government received neither certification nor verification from third parties for GHG emissions unlike other companies due to their particularity. On the other hand, (1) Global Warming Prevention Headquarters with all cabinet ministers attended are annually held in which approval is given, (2) the plans updated/promoted are reported to the GX Implementation Council, chaired by the Prime Minister and external academics participated as necessary.

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

Accordingly, JCR has evaluated that domestic and international experts other than departments in charge of calculating GHG emissions thoroughly control the GX emissions and third parties confirm them as well.

Consequently, JCR has evaluated that the Government of Japan's efforts to achieve carbon neutral by 2050 are based on scientific evidences and meet the requirements in Element 3.

Element 4: Implementation transparency

The Government of Japan decided to invest a total amount of 150 trillion yen in the GX Promotion Strategy, including the public and private sectors for the next 10 years. The specific breakdown is also published by energy supply division and demand division, respectively as follows:

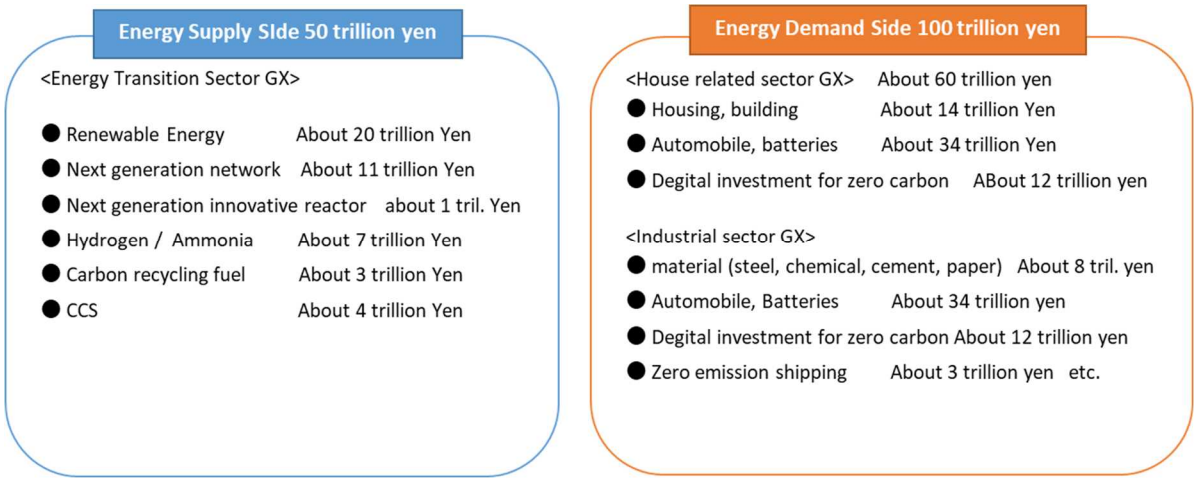


Figure 9-2: Breakdown of public/private investments for the next 10 years[27] (continued on next page)

[27]Sources: Materials for the GX Implementation Conference: Toward the achievement of GX in Japan

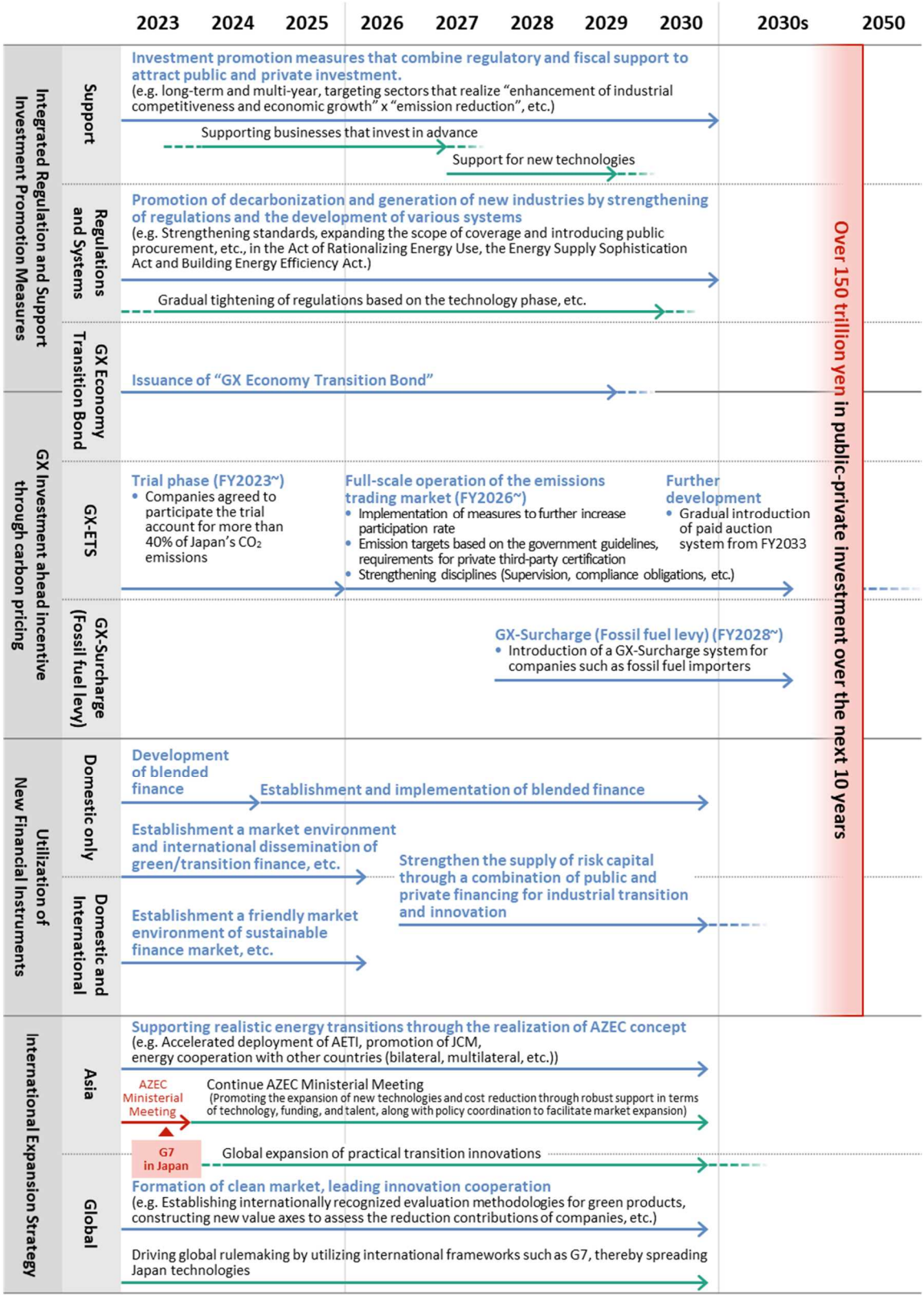


Figure 9-2: Breakdown of public/private investments for the next 10 years[27] (continued from previous page)

Of the total investment of 150 trillion yen, 20 trillion yen is expected to be implemented as an investment promotion measure through GX Economy Transition Bonds. The Government of Japan plans to take the following measures hereafter for this investment promotion measure so as to increase the predictability of companies and attract investors to the GX investment.

1. Refine/finalize specific "sector-specific investment strategies (roadmaps)" for the next 10 years by the end of 2023.
2. Formulate the "preliminary 5-year action plan" based on the 2050 carbon neutral in the roadmaps described in the above (1).

The specific investment details are to be announced when an annual budget request is made since the government's budget is to be implemented in a single year.

Accordingly, JCR has evaluated that the government's investment plans were disclosed, including the government's expenditure plan, investments by both the public and private to be promoted with the expenditure above and 10-year roadmap and is highly transparent.

The sectoral roadmaps formulated by the METI indicated that there are more than one sectors that require business transformation or employment transfer along with the implementation of the transition strategy in Japan. No consideration is needed for direct and just transition like companies' transition strategies since much expenditures through GX economic transition bonds are used for R & D or subsidy programs for companies. On the other hand, the Government of Japan recognizes that the realization of just transition is an important issue when considering Japanese characteristics, which has a high ratio of manufacturing and low mobility of human resources. For this reason, the government will promote just transition as a whole policy package, such as the design of CP that ensures predictability and the consideration in the GX Implementation Council in which academics from the world of labor and the business circle participated.

The possibility of a lock-in to fossil fuels is lower since both of the sectoral roadmap formulated by the Government of Japan and the path in the GX Promotion Strategy are designed to achieve the 2050 carbon neutral, and the roadmap is established not to rely on carbon credit as much as possible and to realize carbon neutral through the next-generation technological innovation.

Serious negative impacts on the environment are considered to be avoided for the viewpoint of DNSH (Do No Significant Harm) since the proceeds in this framework is much used for R & D funds, and the criteria for granting subsidies are clarified in the subsidy program.

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

Evaluation Phase 1: Greenness/Transition Evaluation

gt1(F)

I. Use of Proceeds

JCR's Key Consideration on This Factor

In this section, JCR will firstly confirm whether the proceeds financed are allocated to green/transition projects that bring about clear environmental benefits. Then, in case where negative impacts on the environment and society is expected with the use of proceeds, the impacts will be fully examined by an in-house specialized division or external third parties and will confirm that necessary workarounds and mitigation measures are taken. Lastly, JCR will confirm alignment with the Sustainable Development Goals (hereinafter referred to as "SDGs".)

▶▶▶ Current Status of Evaluation Targets and JCR Evaluation

The GX promotion measures whose proceeds will be used in this framework decided by the Government of Japan are important for achieving carbon neutral in 2050 and realizing interim targets in 2030, respectively and greatly contribute to realizing decarbonized society in Japan.

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 carbon neutrality by 2050 and a 46% reduction (compared to FY 2013 levels) by 2030. 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
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

Evaluation by JCR to the Framework

The Government of Japan declared the "2050 carbon neutral" based on the goals stipulated in the Paris Agreement in October 2020 and legalized by amending the Act on Promotion of Global Warming Countermeasures in 2021. In April 2021, the government also expressed to aim for a 46 per cent reduction in GHG (from FY 2013) in FY 2030, and continuously to challenge to realize 50 per cent as an interim goal for the 2050 carbon neutral. The national government has addressed GX to transform the industrial and social structures on fossil energy-centered since

the Industrial Revolution to clean energy-centered to achieve these goals, based on the Global Warming Measure Plan and the 6th Strategic Energy Plan.

The use of proceeds in this framework was set as R & D funds or subsidy programs for projects that meet the basic conditions set forth in the GX Promotion Strategy (see Chapter 1) from the sector set out in the GX Promotion Strategy as measures that contributes to GX in Japan. These include initiatives, such as maximum utilization of nuclear power and hydrogen/ammonia/ carbon recycling as well as the thorough promotion of energy-saving and the conversion of renewable energy to the main power sources, which should be led by the government, and JCR has evaluated that the aforementioned contents are contributable to achieve the goals indicated by the government. The use of proceeds and the evaluation for which by JCR are shown from the next page.

1. The environmental benefits 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" "Houses 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. ＜Related key policy roadmaps, technology roadmaps＞ Policy roadmaps: Regional and daily life, Iron and Steel industry, Chemical industry, Cement industry, Paper and Pulp industry 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

The use of proceeds No. 1.1 is support for equipment introduction, etc. for energy conservation measures in the industrial sector[28], business sector[29] and household sector[30]. The use of this proceeds falls under the category of "Energy Efficiency" in the "Green Bond Principles," and "Project for Energy Efficiency" in the "Green Bond Guidelines"

[28]Energy consumption in the manufacturing, agriculture, forestry, fisheries, mining and construction industries.
[29]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)
[30]Energy consumption at home, such as cooling, heating, hot water supply, kitchen, power/lighting (excluding transportation, including private automobiles)

The Government of Japan aims to reduce the final energy consumption by 62 million kl from FY 2013 in FY 2030, based on its announcement to aim to reduce GHG by 46 per cent from FY 2013 in FY 2030 and will continue challenging to achieve 50 per cent. This energy saving amount is assumingly a result of accumulation with as many technically feasible and realistic energy-saving measures as possible in the industrial sector, business sector, household sector and transportation sector[31], respectively after the estimation is made on the demand before taking additional energy-saving measures, based on the economic growth rate of the economic revitalization cases in "Estimation of medium- to long-term economic and fiscal policy" by the Cabinet Office (July 2021,) the latest population estimate (medium estimate) by the National Institute of Population and Social Security Research and the estimated amount of activities in major industries.

The use of this proceeds includes support for energy conservation measures in the industrial sector, business sector and household sector. Specifically, it is a subsidy system implemented by ministries and agencies for the newly introduction or increase/replacement of energy-efficiency equipment. For example, METI has already implemented a subsidy for energy-saving promotion projects in the household sector by promoting the introduction of high-efficiency water heaters and a subsidy for energy-efficiency investments and transitioning demand structure. These are assumed to be subsidies for equipment with high energy-saving performance that meets the standards such as energy-saving rate and energy-saving amount at factories and offices. Accordingly, JCR has evaluated that the use of this proceeds is support for promoting energy saving and is align with the energy saving policy set by the Government of Japan to achieve NDC.

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" "Houses and buildings" "Digital investment aimed at decarbonization" "Battery industry"

No.1.2 Houses and Building
To achieve the fundamental energy efficiency improvement of houses and buildings (e.g., ensuring energy-saving performance at the ZEH[32] and ZEB[33] level for new houses and buildings by 2030), the expansion and strengthening of regulations through Building Energy Efficiency Act and other measures will be implemented over the next 10 years. ＜Related key policy roadmaps, technology roadmaps＞ Policy roadmaps: Houses and buildings, Regional and daily life
＜Examples of initiatives (overview, etc.)＞

[31] Total energy consumption in the passenger sector, such as passenger cars or buses and the cargo sector, such as land transportation, shipping or air cargo
[32] The abbreviation for Net Zero Energy House
[33] The abbreviation for Net Zero Energy Building

- 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 the 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.

The use of proceeds No. 1.2 is support for equipment introduction, etc. for drastic energy-saving measures for housing/buildings. The use of this proceeds is categorized into "Energy Efficiency" in the "Green Bond Principles," and "Project for Energy Efficiency" in the "Green Bond Guidelines."

In August 2021, the Government of Japan compiled "How to take energy-saving measures in housing/building for decarbonized society" in which the ideal figures in 2030 and 2050 through thorough energy saving by ensuring/improving energy saving performance and increasing the introduction of renewable energy are as follows:

The ideal houses/buildings in 2050

(Energy saving) The stock average of energy saving performance of ZEH/ZEB standard levels (* 1) is secured.

(Renewable energy) It is becoming common to introducing renewable energy, such as solar power generation equipment in houses/buildings where the introduction is rational.

The ideal houses/buildings in 2030

(Energy saving) Energy saving performance (* 2) at the level of ZEH/ZEB standards is secured for newly built houses and buildings.

(Renewable energy) Solar power generation equipment will be introduced in 60 per cent of the newly built houses.

(* 1) On stock average, the primary energy consumption of houses will be reduced by roughly 20 per cent from the energy saving standard, and that of the building will be reduced by about 30 per cent or 40 per cent depending on the application.

(* 2) Housing: A 20 per cent reduction in the primary energy consumption, excluding reinforced envelop standards and renewable energy from the current energy saving standard values

Buildings: A 30 per cent or 40 per cent reduction depending upon the application as same as the above housing (a 20 per cent reduction for small buildings)

The use of proceeds refers to a subsidy program for the process of introducing various facilities with high energy-saving performance, which is required in housing/building along with increasing/strengthening the scope of regulations due to the Building Energy Conservation Act planned in the future in order to realize the above-mentioned ideal figures. An example given in this framework is a subsidized program for retrofitting to insulated windows in the existing houses.

It is urgent to take energy conservation measures for houses since approximately 90 per cent of the existing houses do not meet the current energy conservation standards although the retrofithousehold sector should have aimed to reduce GHG by 66 per cent by FY 2030 under the Global Warming Measure Plan. In particular, insulation renovation, which reduces heat transfer inside and outside houses, will directly improve the operating efficiency of air conditioners/heaters, which mostly account for the CO_2 emission sources in the household sector and will greatly contribute to reducing energy consumption. It is estimated that 16.5 million units or roughly 60 per cent of the existing houses in Japan have used single plate glass for which heat insulation measures are not taken according to a survey by LIXIL. It is estimated that CO_2 emissions of 6.6 million tons-CO_2 will be annually reduced on the condition that nine windows in all residential rooms of the houses without heat insulation are renovated.

Consequently, JCR has evaluated that the measures to use this proceeds promote to reducing energy consumption and converting energy to renewable energy from CO_2 emissions of new construction and the existing buildings from both aspects.

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" "Houses 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. Additionally, carbon neutrality of data centers will be promoted by leveraging these technologies. ＜Related key policy roadmaps, technology roadmaps＞ Policy roadmaps: Digital investment aimed at decarbonization
＜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

The use of proceeds No. 1.3 is R & D and support for equipment introduction, etc. in the digital sector to significantly improve energy efficiency. The use of this proceeds is categorized into "Energy efficiency," "Clean transportation" in the "Green Bond Principles", and exemplified in "Projects for Energy Efficiency" and "Project for clean transportation" in the "Green bond guidelines."

Electrification in various sectors is planned by introducing maximum renewable energy to achieve the 2050 Carbon Neutral. Innovation to improve energy efficiency is essential in each sector since the demand for IT telecommunications-related electricity consumption is expected to increase through promoting DX. This proceeds will be used for subsidy programs or R & D expenses for digital investment technology to achieve significant improvements in energy efficiency in various business categories, such as the material industry, semiconductor industry and data communication industry in Japan.

The following two technologies are illustrated in this framework.

1. Auxiliary programs for capital expenditures in supply chains that contribute to significant improvements in energy efficiency, such as SiC power semiconductors for EV vehicles

   SiC power semiconductor refers to a semiconductor whose main material is "SiC (silicon carbide)" that is a compound of Si (silicon) and C (carbon.) SiC power semiconductors have the following characteristics by comparing to Si power semiconductors.

   - Can withstand higher voltages, currents and operating temperatures
   - There is little energy loss in controlling power since the thickness of the place where electrical resistance occurs can be reduced to roughly 1/10.
   - The equipment can be minimized since radiator mechanisms for suppressing heat generation due to energy loss (all of which are usually released as heat) can be made smaller and simplified.
   - The distance travelled is longer on a single charge since there is little energy loss, and the equipment that controls power operates efficiently etc.

It is expected to support the spread of EV as a "next-generation power semiconductor" that can achieve higher performance and energy saving instead of Si power semiconductors by taking advantage of these features above.

2. R & D expenditures for optoelectronic fusion technology that is expected to reduce energy consumption by up to 40 per cent in data centers.

Optoelectronic fusion is a technology that fuses circuits that handle electrical signals and optical signals. Calculations have been performed with "binary numbers" by switching on and off of the electricity in conventional computers. Electricity however generates heat when it flows through circuits, and energy is used to generate heat that is not originally necessary, and when it generates heat, the resistance of the electric paths increases, leading to decreases in the calculation speeds. Therefore, research is underway to replace calculation using electricity with processing using light. Power saving and low latency are achieved by connecting internal circuits in computers with light without using electricity as much as possible. The aim is to gradually introduce light into computing chips or peripheral equipment in computers that have been processed by electricity. The aims are (1) to establish a technology that connects chips used for calculation and peripheral equipment with light in 2024, (2) to connect between chips with light in 2024 and (3) to practically realize a photoelectric fusion chip that calculates with light in the final stage in 2030. There are some estimation that the spread of optoelectronic fusion technology will save more than 40 per cent of energy by 2030 compared to the current state-of-the-art data centers.[34]

Accordingly, JCR has evaluated that the use of this proceeds improves energy efficiency through next-generation digital technology in the transportation sector and the information and communications sector.

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" "Houses 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 in battery production facilities will be implemented over the next 5 years while creating demand by approaching demand side through the Act on Rationalizing Energy Use over the next decade ＜Related key policy roadmaps, technology roadmaps＞ Policy roadmaps: Battery industry

[34] NTT Story at https://group.ntt/jp/magazine/blog/photonics_electronics_convergence/

<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
  - 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)

The use of proceeds No. 1.4 is aimed to achieve the goal of establishing a domestic manufacturing infrastructure for batteries with a capacity of 150GWh by 2030 and includes investments in manufacturing factories, such as storage batteries or parts/materials and R & D related to next-generation storage batteries/ materials/recycling technologies. The use of this proceeds falls under the category of “Energy efficiency," "Renewable energy," "Clean transportation" in the "Green Bond Principles." Also, it exemplified in "Projects for energy efficiency," "Projects for renewable energy" and "Project for clean transportation" in the "Green Bond Guidelines."

Storage batteries are the most important technology in the electrification, and the demand for in-vehicle storage batteries will increase significantly. The sales ratio of new electric vehicles (plug-in hybrid and EV vehicles) or fuel cell vehicles was 13 per cent in 2022; however, it is expected to increase to 70 per cent in 2030 and 100 per cent in 2050 in the NZE scenario of the IEA. Technically, liquid-based lithium-ion batteries (liquid-based LiB) are currently mainstream, and Chinese and Korean manufacturers account for more than 70 per cent in the market in 2020[35]. All-solid-state batteries are one of the leading next-generation storage battery technologies. All-solid-state batteries will be practicalize toward 2050 since the risk of ignition is smaller as well as energy density is higher. Japan has presently applied for patents for all-solid-state batteries more than any other countries and has a technological advantage; however, the number of applications by China has increased sharply in recent years[35].

Storage batteries are also important as adjustment power (grid storage batteries) in electricity systems. The capacity of storage batteries in the global electric power sector is expected to increase from 45 GW in 2022 to 1,018 GW in 2030 and 4,119 GW in 2050 in the IEA's NZE scenario. The demand will increase significantly, as will automotive storage batteries. Variable Renewable Energy (hereinafter referred to as "VRE") such as solar and wind power fluctuates in power generation output depending on weather conditions; therefore, if the VRE ratio in the electrical grid increases, the frequency and voltage fluctuations along with fluctuations in the VRE power generation output may affect the electrical grid, and power for supply-demand adjustments is required for these fluctuations. The United States is leading the market for grid storage batteries

[35] Storage Battery Industry Strategy, August 2022, by METI
(https://www.meti.go.jp/policy/mono_info_service/joho/conference/battery_strategy/battery_saisyu_torimatome.pdf)

and their introduction have been promoted by state governments and electric power companies. Development of power grids that can respond to fluctuating output, vital for wider introduction of renewable energy is positioned as one pillar as future renewable energy policies in the the Basic Policy for the Realization of GX, decided by the Cabinet in February 2022 in Japan and the introduction of stationary storage batteries, including grid storage batteries is expected to accelerate.

The Government of Japan published the "Storage Battery Industry Strategy"[36] in August 2022. The government listed the three following directions hereafter: (1) support large-scale investments to strengthen the manufacturing bases for liquid-based LiB and establish domestic manufacturing bases, (2) Strategically expand the products overseas and secure its global presence, (3) accelerate technological development to practicalize next-generation batteries, such as all-solid-state batteries ahead of the rest of the world, and steadily make the next-generation battery markets the core, based on the thinking-over on the current situation where Japanese companies are lagging behind Chinese and Korean companies in the manufacturing liquid-based LiB. As goals for each of the aforementioned from (1) to (3), the government set forth the followings: (1) to establish domestic manufacturing bases for storage batteries/materials of 150 GWh/year by 2030 at the latest, (2) to secure a manufacturing capacity of 600 GWh/year for all domestic companies in the global market by 2030, and (3) to practicalize all-solid-state batteries around 2030, and maintain/secure its position as a technological leader in and after 2030. The use of this proceeds will be allocated for concrete support measures to achieve this goal.

Accordingly, the use of this proceeds contributes not only to carbon neutral in Japan but also to the global carbon neutral by increasing the supplies of the global storage batteries and the efforts are contributable to the Paris Agreement.

(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, we aim 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 the next 10 years.

[36]Source: Storage Battery Industry Strategy, August 2022, METI, (https://www.meti.go.jp/policy/mono_info_service/joho/conference/battery_strategy/battery_saisyu_torimatome.pdf)

＜Related key policy roadmaps, technology roadmaps＞ Policy roadmaps:　Renewable energy, Next generation network (grid and conditioning), Regional and daily life 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

The use of proceeds No. 2.1 refers to support intended for social implementation of next-generation renewable energy technology for the maximum introduction of renewable energy, including R & D of domestic next-generation solar power generation and establishment of mass production systems, technological development and formation for large-scale offshore wind power projects, including floating offshore wind turbines, and it also includes support for equipment introduction, etc. for developing submarine direct current transmission networks. The use of proceeds is categorized into the "Renewable energy" in the "Green Bond Principle," and "Projects for renewable energy" in the "Green Bond Guidelines."

Renewable energy, such as solar power, wind power, geothermal power, hydropower and biomass is clean energy that uses natural resources as energy sources and does not directly emit GHG and can replace fossil fuels used in thermal power generation. It is necessary to introduce technologies that are currently available and cost-effective at an early stage to achieve the short-term GHG reduction targets under which solar power generation and wind power generation fell in the first place. It is also assumed that solar power generation and wind power generation will be rapidly introduced to reduce 4 Gt-CO_2 by solar and wind power generation by 2030 in the IEA's NEZ scenario. Electrification will account for roughly a quarter of the GHG reductions from 2030 to 2050 in the scenario. Increasing the ratio of renewable energy, mainly solar and wind, is important in the power supply configuration since electrified equipment is normally operated with the power received from the power systems. As mentioned above, introducing renewable energy; mainly solar power or wind power must be prioritized to achieve the global carbon neutral.

The 6th Strategic Energy Plan approved by the Cabinet in October 2021 indicated that the government will, in principle, prioritize renewable energy in Japan. The government will promote to introduce the maximum renewable energy toward the "Carbon Neutral Declaration" in 2050, a 46 per cent reduction in CO_2 emissions in 2030, and the realization of new reduction targets that will continuously challenge to reach a 50 per cent. In February 2023, the Cabinet approved the "Basic Policy for the Realization of GX," which states the policies to create new demand/markets in the stable energy supply sector and decarbonization sector, increasing industrial competitiveness/economic growth in the Japanese economy by accelerating GX.

		(FY2019 ⇒ previous energy mix)		Energy mix in FY2030 (ambitious outlook)	
Energy efficiency improvement		(16.55 million kl ⇒ 50.30 million kl)		**62 million kl**	
Final energy consumption (without energy conservation)		(350 million kl ⇒ 377 million kl)		350 million kl	
Power generation mix	**Renewable energy**	(18% ⇒ 22-24%)	solar 6.7% ⇒ 7.0% wind 0.7% ⇒ 1.7%	**36-38%** ※If progress is made in utilization and implementation of R&D of renewable energy currently underway, 38% or higher will be aimed at.	
Electricity generated: 1,065 TWh ⇒ Approx. 934 TWh	**Hydrogen/Ammonia**	(0% ⇒ 0%)	geothermal 0.3% ⇒ 1.0~1.1%	**1%**	
	Nuclear	(6% ⇒ 20-22%)	hydropower 7.8% ⇒ 8.8~9.2%	**20-22%**	(details of renewable) solar 14~16% wind 5%
	LNG	(37% ⇒ 27%)	biomass 2.6% ⇒ 3.7~4.6%	**20%**	geothermal 1% hydropower 11%
	Coal	(32% ⇒ 26%)		**19%**	biomass 5%
	Oil, etc.	(7% ⇒ 3%)		**2%**	

Figure 10: 6th Strategic Energy Plan[37]

In April 2023, the Government of Japan announced the "Action Plan for Expanding the Introduction of Renewable Energy in Collaboration with Relevant Ministries and Agencies," based on the "Basic Policy for the Realization of GX" to materialize and strongly promote efforts to accelerate the introduction of renewable energy in which the acceleration of innovation is listed as a policy for improving the environment for the introduction of renewable energy. The government aims for the early realization of mass production systems and the construction of robust supply chains as well as development/implementation of technologies for perovskite solar cells, which are next-generation solar cells or floating offshore wind power so as to realize more robust energy supply structures for improving the rate of self-sufficiency technologies for renewable energy. The perovskite solar cells are a technology invented in Japan for the first time, aiming to implement them in society as soon as possible prior to 2030 and will promote to establish mass production technology, to create demand and develop production systems as a trinity. The Action Plan also mentions the need to balance the promotion and disciplines of renewable energy. The relevant ministries and agencies collaboratively increase to install solar panels in public facilities, housing, factories and warehouses, airports or railways while promoting to introduce regional-led renewable energy and utilizing the Act on Promotion of Global Warming

[37]Source: The 6th Strategic Energy Plan, October 2021(Updated on Nov 26, 2021), Agency for Natural Resources and Energy, (https://www.enecho.meti.go.jp/en/category/others/basic_plan/pdf/6th_outline.pdf)

Countermeasures since it is required to increase the introduction of renewable energy while coexisting with the local community.

The use of this proceeds includes (1) support for technological development/large-scale demonstration/mass production system development of next-generation solar cells, (2) technological development for cost reduction of offshore wind power generation, (3) support for demonstration project/social implementation/supply chain construction of floating offshore wind power generation and (4) support for the introduction of renewables that can coexist with local communities. The use of these proceeds is in line with the Government of Japan's policies of promoting the introduction of renewable energy mainly in solar and wind power while supporting the development of next-generation technologies and the construction of large-scale and robust supply chains.

The Government of Japan has actually begun "Cost Reductions for Offshore Wind Power Generation" and "Development of the Next-Generation Solar Cells" under the Green Innovation Fund (hereinafter referred to as "GI Funds") as a preceded example of the use of this proceeds and has started to support technological development and social implementation while considering the projects to support the construction of supply chains hereafter.

On the other hand, it is necessary to transport the electricity generated by renewable energy to the consumption area where the demand for electricity is higher via grid networks to make renewable energy the main power sources. Offshore wind power generation is the most likely to be developed in the future among the renewable energy power sources, and 80 per cent of the offshore wind power generation facilities are expected to be introduced in Hokkaido, Tohoku and Kyushu; therefore, it is necessary to increase the grids from those regions to Tokyo, Kansai and Chubu regions, which are consumed more power according to the "Master Plan for Wide Area Interconnection System[38]" established in March 2023. Enhancing the power infrastructure is required to ensure stable supplies of power in light of the Hokkaido Eastern Iburi Earthquake in 2018, large-scale power outages caused by heavy rains and typhoons in recent years or damage to power lines, and the government will promote the development of systems that require power transmission/distribution companies to systematically renew the existing facilities or a wheeling fee system (revenue cap system) that enhances the transmission/distribution systems while securing cost efficiency under the Electricity Business Act, which was amended by the Energy Resiliency Act in June 2020.

The proceeds will be used for subsidies for capital investments related to submarine direct current transmission projects shown in the "Master Plan for Wide Area Interconnection System" in this framework. The use of this proceeds is expected to increase power grids by several millions of kW, particularly in Hokkaido and the Tokyo/Tohoku regions. JCR has evaluated this as efforts to contribute

[38] Long-term policies for regional grid connection (master plan for regional grid connection) <separate volume (material edition)> at https://www.occto.or.jp/kouikikeitou/chokihoushin/files/chokihoushin_23_01_02.pdf

to the achievement of the two goals of making renewable energy the main power sources and making the transmission/distribution network more resilient.

Figure 11: Master Plan for regional grid connection system, Measures to enhance the base scenario

(Please refer the website of Organization for Cross-regional Coordination of Transmission Operators, JAPAN (Japanese)[38])

Accordingly, JCR has evaluated that the use of this proceeds is initiatives that directly contribute to the achievement of decarbonization targets in Japan and is in line with the Government of Japan policies.

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"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 policy roadmaps, technology roadmaps＞ Pocilcy roadmaps:　Infrastructure, Regional and daily life
＜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

The use of proceeds No. 2.2 refers to support for equipment introduction, etc. for microgrids in private projects to maximize the use of renewable energy in communities and to increase resilience in times of disasters. The use of this proceeds is categorized into the the "Renewable Energy" in the "Green Bond Principles," and into "Project for renewable energy" among the use of proceeds exemplified in the "Green Bond Guidelines."

A microgrid refers to a small-scale energy network that does not rely on the power supply provided by large-scale power plants but has energy supply sources and consumption facilities in own community, aiming for local production for local consumption. Renewable energy sources, such as solar power generation, wind power generation and biomass power generation are used as energy sources; however, it is difficult to meet energy demand since renewable

energy supply is intermittent. The characteristics of the microgrid is to manage/operate with information and communication technologies to stabilize the energy.

The advantages of microgrids are to reduce power loss by building small-scale facilities for power generation near the end users from which electricity is provided. In cases where the power generation facilities in the area are not damaged during disasters, the recovery time can be shorten by switching to local production for local consumption.

One example of the use of proceeds in this framework is a subsidy program that supports the introduction of major decarbonization products/technologies with high emission reduction effects in areas (specific areas) where self-owned line microgrids that benefit private enterprises through public-private partnerships are constructed among the areas designated by the Ministry of the Environment as leading areas for decarbonization.

The use of this proceeds is expected to reduce CO_2 emissions during transmission and distribution by promoting to place small-scale renewable energy in the end users' areas, by increasing the supply capacity of renewable energy and by efficiently promoting local production for local consumption through information and communication technology. It is expected to strengthen regional resilience in times of disasters due to quick restore power by placing privately owned microgrids and by operating the storage batteries installed in the system or biodiesel power generation for disaster use without waiting for high-voltage systems to return.

(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 policy roadmaps, technology roadmaps＞ Policy roadmaps: Next-generation innovative reactors Technology roadmaps: Power sector
< Examples of initiatives (overview, etc.)> ● 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.

The use of proceeds No. 3.1 refers to the R & D funds for the next-generation innovative reactors. The government has positioned the use of proceeds as one of the projects toward carbon neutrality by 2050, which is the goal of the Government of Japan although the proceeds will not be used for the projects illustrated in the "Green Bond Principles" and "Green Bond Guidelines."

The "utilization of nuclear power" is set out as an eligible criterion in the GX Economy Transition Bond and it is also cited as one of the " Decarbonization initiatives towards GX based on the premise of ensuring a stable energy supply" in the " The Basic Policy for the Realization of GX" published by the Government of Japan in February 2023.

The only nuclear power generation system currently commercially operated is light water reactors in Japan. The nuclear power can provide decarbonized power in large quantities and in a stable manner, and the rate of facilities which procuded domestically for nuclear power plants in Japan exceeds 90 per cent in many power plants, which has advantages of accumulating know-how, including technology. The nuclear power also plays a role as base load power sources that support renewable energy, which is intermittent energy sources and it is also expected to meet diverse social demand, such as carbon-free hydrogen production or heat utilization in the future.

On the other hand, Japan has experienced the Fukushima Daiichi Nuclear Power Station accident in 2011 and various events related to nuclear facilities although they did not lead to any accidents. It is necessary to further improve the safety of light water reactors and to promote R & D for nuclear innovation of groundbreaking technology based on the premise of ensuring safety for the development of nuclear technology. The goal is to achieve improvements in resource recycling by reducing the volume/harmfulness of such high-level radioactive waste and by effectively using resources based on so-called "S + 3E" such as **e**nergy security, **e**conomic efficiency and alignment with the **e**nvironment on the premise of ensuring **s**afety through further technological development in the future.

In constructing the current light water reactors above, China and Russia are dominating the market supported by their governments, and developed countries, such as the United States, the United Kingdom and Canada are promoting R & D for small reactors and innovative reactors with large budgets, aiming for the commercialization around 2030.

The Government of Japan is aiming: (1) to steadily promote developing high-speed reactors with international collaboration, (2) to demonstrate technology for small modular reactors through international collaboration by 2030, (3) to establish elemental technology on hydrogen

production in high temperature gas reactors by 2030 and (4) to steadily promote R & D for nuclear fusion through international collaboration, such as International Thermonuclear Experimental Reactor (hereinafter referred to as "ITER".)

The specific use of proceeds for "utilization of nuclear power" in the GX economy transition bonds is the R & D funds on the "next-generation innovative reactors."

The "next-generation innovative reactor" refers to five reactors, such as "Innovative light water reactor," Fast reactor," "High temperature gas reactor," "Small modular reactor (SMR)" and "Fusion reactor." The characteristics of respective next-generation innovative reactors are as follows:

1. Innovative light water reactor

Innovative light water reactor refers to a light water reactor with new technology introduced, based on the current light water reactors. Enhancing resilience to natural disasters, including earthquakes and tsunamis and improving safety, such as anti-terrorism measures are pursued in the innovative light water reactors, based on the lessons learned from the Fukushima Daiichi Nuclear Power Station accident. A design is incorporated to retain radioactive materials in power plant sites even in times of meltdowns.

2. Fast reactor

A fast reactor is a reactor whose fission chain reaction is maintained by high-energy neutrons (fast neutrons.) Fuels with increased fuel density in the fuel assembly are used without moderators like light water reactors do in order for high speed neutrons to avoid decreasing speeds since fuels are undergone with high-speed neutrons. High-speed reactors utilize high-speed neutrons to further enhance the effects of nuclear fuel cycles by reducing the volume /harmfulness of such high-level radioactive waste and effectively utilizing resources.

Russia achieved the first criticality of the demonstration reactor in 2015, and China has developed a demonstration reactor, aiming to complete its construction in 2023 in the world. The United States is also accelerating its efforts to develop a fast reactor with venture companies supported by their government in North America, for instance, it decided to provide up to 160 billion yen in development support to venture companies for fast reactors who aim to build demonstration reactors within seven years in 2020.

The Government of Japan formulated a "Strategic Roadmap" for the development of fast reactors in the Ministerial Meeting on Nuclear Energy in December 2018 and revised it in 2021. According to the "Strategic Roadmap," it is expected that realistic fast reactors will be appropriately put into operation around the middle of the 21st century, with a view to full-scale use of fast reactors in the second half of the 21st century from the perspectives of technology maturity, finance or operating experience.

Preparations are currently underway for the step 2 in which the national government, the Japan Atomic Energy Agency (hereinafter referred to as "JAEA") and electricity providers with the cooperation of manufacturers, will narrow down the technology in and after 2024. In the step 2, the process will be embodied in cases where a certain technology is selected (step 3.) The government is promoting international cooperation on fast reactors with countries in which research on fast reactors is progressing, such as the United States and France.

3. High-temperature gas reactor

A high-temperature gas reactor refers to a nuclear reactor that uses ceramic materials, mainly graphite as the major components of reactor cores and that utilizes helium gas as coolant for taking out the heat generated by nuclear fission. In particular, a reactor with its outlet coolant temperature between 700 °C and 950 °C is called a high-temperature gas reactor. Ceramic materials with excellent heat resistance allow energy to be extracted from high-temperature heat of 700 °C or higher and to be used for power generation or to have the potential for hydrogen production using a high-temperature gas reactor. One shaft reactor capable of full hydrogen reduction ironmaking may be possibly decarbonized with one high-temperature gas reactor for hydrogen production, which is attracting attention in decarbonization in industrial sectors, including ironmaking and chemistry. Hydrogen production in high-temperature gas reactors needs a site area of roughly 1/1,600 only of that of hydrogen production in solar power generation.

The United States and the United Kingdom are providing support for high-temperature gas reactors as their policies, and JAEA is participating as a business operator in the development of high-temperature gas reactors in the United Kingdom.

In Japan, JAEA has a High Temperature Engineering Test Reactor (HTTR.) The test reactor, HTTR has the world's leading technology, such as: it achieved 50 days of continuous operations at the world's highest temperature of 950 °C, and it also conducted tests by simulating accidents in which coolant is lost, similar to that of the Fukushima Daiichi Nuclear Power Station accident and confirmed that the reactor cools naturally. The government plans to develop technology necessary for large-scale and inexpensive carbon-free hydrogen production by 2030 as well as to internationally demonstrate safety with the test reactor, HTTR. R & D will be conducted on carbon-free hydrogen production methods utilizing ultra-high temperature heat, including the IS method and methane pyrolysis method.

4. Small modular reactor (SMR)

SMR refers to a nuclear power facility with a smaller output than that of conventional nuclear power plants, and it refers to an electric output of 300 MW or less per unit as defined by the International Atomic Energy Agency (IAEA.) SMR has various reactor types, such as light water reactors, fast reactors, high-temperature gas reactors, molten salt reactors and microreactors depending upon coolant and output. SMR is relatively easy to incorporate natural principles into

safety equipment, such as the cooling mechanism of reactors using natural circulation and to avoid outages caused by human errors or equipment failure and also possibly to improve the reliability of safety systems through system simplification due to its small reactor cores. The government is aiming to reduce initial investment costs by shortening the construction period through module production and to ease site selection/funds limitation during construction.

In the world, the United States is formulating safety standards and industrial standards for SMR ahead of the rest of the world, and projects for constructing demonstration reactors for SMR and subsequent expansion to third countries are underway in the United Kingdom and Canada. Japanese companies are working to participate in these projects by making investments and developing SMR, looking ahead to diverse needs through their unique design.

5. Fusion reactor

The fusion reactor is not a reactor with the fission reaction as described above but a nuclear reactor that generates energy by using the fusion reaction of light atoms, such as hydrogen. The fusion reactor has technology that can use heat/produce hydrogen as well as generating power by generating plasma of 100 million °C or higher and by heating the coolant to a maximum of roughly 1,000 °C. As mentioned above, fuels are basically hydrogen and high-level radioactive waste that needs long term management is not generated. There is no runaway risk of the reactor and safety is high since the plasma generation technology is difficult to maintain the reaction.

The construction/production of various equipment for ITER are underway with the cooperation of seven poles around the world, including Japan, aiming to start its operation in 2025, and the assembly/installation of the ITER main units began in July 2020. Simultaneously, tests are conducted for the advancing plasma control technology with large tokamak equipment (JT-60SA) under construction in Japan for supplementing the ITER plan and future nuclear fusion prototype reactors under the cooperation of Japan and Europe. Many venture companies have been established with the aim of early realizing fusion power generation in the United States, the United Kingdom and Canada.

The followings are examples of the use of proceeds in this framework:

(i) Development of fast reactors for industrial demonstration

The specifications and core companies for fast reactors will be selected and R & D on demonstration reactors will be conducted, which is subject to conceptual design that represents the concept of the structure or mechanism of fast reactors in and after FY 2024, based on the "strategic roadmap" for fast reactor development revised on December 23, 2022.

(ii) Development of high-temperature gas reactor for industrial demonstration

The Agency for Natural Resources and Energy will conduct a feasibility study on carbon-free

hydrogen production methods using the high temperature of 800 °C or higher and will carry out R & D on the establishment of connection technologies and evaluation methods that realize high safety with hydrogen production technology through decarbonized high temperature heat sources of 800 °C or higher and a methane steam reforming method[39] that has already been commercialized.

JCR has evaluated that the aforementioned two cases use proceeds for R & D related to next-generation innovative reactors and are important initiatives for decarbonizing Japan in the future.

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

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"

No.3.2 Establishing electricity and gas markets to achieve carbon neutrality
Towards the expansion of low-carbon and decarbonized energy sources such as hydrogen, ammonia, nuclear power, and renewable energy, necessary environmental development such as research and development for securing Japan's technological advantage, establishing domestic advanced research facilities, grid integration and ensuring the conditioning, will be implemented ＜Related key policy roadmaps, technology roadmaps＞ Policy roadmaps: Next-generation network (grid and conditioning), Hydrogen and ammonia 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[40]), 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)

The use of proceeds No. 3.2 refers to a project for R & D on zero-emission thermal power and support for equipment introduction, etc. to construct hydrogen and ammonia supply chains. The use of this proceeds is categorized into "Circular economy adapted products and production technologies and projects concerning eco-efficient products" among the use of proceeds exemplified in "circular economy adapted products and production technologies and processes" and the "Green Bond Guidelines" in the "Green Bond Principles."

[39] To take out carbon monoxide (chemical formula: CO) and hydrogen (chemical formula: H_2) by making methane (chemical formula: CH_4) and water vapor (chemical formula: H_2O) react with a metal catalyst at high temperatures.
[40] Abbreviation for Methylcyclohexane

The method to burn fossil fuels, such as coal, natural gas and oil to extract energy is mainly used in the thermal power generation in Japan for the present moment. The CO_2 emitted from these thermal power generation accounted for 432 million t-CO_2 in FY 2020, which is a large proportion compared to the Japan's overall GHG emissions of 1.15 billion t-CO_{2e} (CO_2 equivalent in FY 2020.)

The Transition Roadmap for Power sector indicated by METI[41] shows that the government will move forward to zero-emission thermal power generation, which is a power generation method that does not emit CO_2, such as hydrogen/ammonia from fossil fuels, including coal for thermal power generation in the future.

Efforts on zero-emission thermal power are broadly divided into two categories: efforts related to fuels (hydrogen/ammonia) and efforts on CO_2 emitted (Carbon Capture Storage (CCS), Carbon Recycling/CCUS.)

Efforts for both of ammonia-only and hydrogen-only combustion are developed for practical use in the GI Funds and the NEDO projects for fuels, and experiments have been conducted in 2MW-scale dedicated combustion gas turbine facilities for ammonia, and research is underway to develop a large-scale dedicated combustion gas turbine facility for industrial use by around 2030. Hydrogen-only combustion gas turbines that reduce the emission of nitrous oxide, which is GHG, have been developed and the demonstration test has been successful for hydrogen.

Experiments for co-firing ammonia have been underway in the JERA's Hekinan thermal power plant since 2023. Co-firing experiments have begun since October 2023 in the Tohoku Electric Power's Niigata Thermal Power Plant, and technological development is underway, aiming to further increase the co-firing ratio.

Among the efforts on CO_2, demonstration experiments on CO_2 storage have started since 2012 for CCS in the bed off Tomakomai, Hokkaido and a total of 300,000 tons-CO_2 have been injected by 2019. R & D for the production of plastic raw materials using CO_2 recovered as raw materials or the production of fuels (SAF[42]) that replace fossil fuels are planned in the future for carbon recycling/CCUS.

R & D Funds to achieve a hydrogen co-firing ratio of more than 30 per cent is listed as an example of the use of proceeds in this framework. In particular, the government is aiming for a co-firing ratio that meets the standards for qualified gas-fired power generation in the EU Taxonomy, and JCR has evaluated that the use of proceeds will contribute to CO_2 reduction toward carbon neutral in 2050.

JCR has evaluated that efforts on the use of hydrogen/ammonia are aligned with the targets established for ammonia co-firing in the Transition Roadmap for Power sector presented by METI

[41] Transition Roadmap for Power sector at https://www.meti.go.jp/policy/energy_environment/global_warming/transition/transition_finance_technology_roadmap_power_eng.pdf
[42] SAFI: Sustainable aviation fuel

and the Roadmap to Zero Emission from International Shipping by the Ministry of Land, Infrastructure, Transport and Tourism.

(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 CO2 emissions, to achieve the 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, we will systematically and strategically promote initiatives for the transition to clean energy over the next 10 years, taking into account the Act on Rationalizing Energy Use, etc. We will also aim to expand private investment in related industries such as transportation businesses. ＜Related key policy roadmaps, technology roadmaps＞ Policy roadmaps: Automobile industry, Aviation industry, Zero-emission vessels (maritime industry), Transportation, Carbon recycling fuels (SAF, synthetic fuels, synthetic methane), Regional and daily life Technology roadmaps: Automobile sector, Oil sector, International shipping sector, Domestic shipping sector, Aviation sector
＜Examples of initiatives (overview, etc.)＞ ● 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[43] 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

The use of proceeds No. 4.1 refers to the R & D and support for equipment introduction, etc. for decarbonization in the automobile sector, aircraft sector and marine sector. The use of this proceeds falls under the category of "Clean Transportation" in the "Green Bond Principles," and "Project for clean transportation" in the "Green Bond Principles."

[43] Abbreviation for Nitrogen oxides

<Automobile sector>

This use of proceeds covers next-generation vehicles[44], such as EV (electric vehicle) FCV (fuel cell vehicle) and PHEV (plug-in hybrid vehicle) and charging/filling facilities for vehicles for which their introduction will be supported. For the introduction of EVs and PHEVs, vehicles that are subject to the 2030 fuel efficiency standard (25.4km/L at Well-to-Wheel[45]) of the top runner programme (Act on Rationalizing Energy Use) will be introduced.

CO_2 emissions from automobiles account for approximately 20 per cent of Japan's total emissions, and it is an important issue to reduce CO_2 emissions from automobiles to promote measures against global warming. Individual goals are established for carbon neutral in the entire life cycle of automobiles in 2050 in the Technology Roadmap for "Transition Finance" in Automobile sector formulated in March 2023. The main goals are as follows:

[Goal of electrification]

- Make electrified vehicles, which mean EVs, FCVs, PHEVs and HVs in this goal, account 100 per cent of sales of new passenger vehicles by 2035
- Commercial vehicles:
  - As for small vehicles of 8t or smaller, aim to make electrified vehicles (as same as above) account for 20 to 30 per cent in sales of new vehicles by 2030 and 100 per cent in combination with use of decarbonized fuel such as electricity and synthetic fuel by 2040
  - As for large vehicles over 8t, aim at advanced introduction of 5,000 vehicles in 2020s and set the prevalence goal of electrified vehicles (as same as above) in 2040 by 2030

[Goals for charging/filling infrastructures]

- The government will establish 150,000 charging infrastructures, including 30,000 public quick chargers and will realize the same convenience as gasoline vehicles by 2030.
- Approximately 1,000 hydrogen stations will be installed in optimal layouts by 2030.

The spread of next-generation vehicles or improvements in fuel efficiency are listed as one of the efforts on decarbonization in the transportation sector in the Plan for Global Warming Countermeasures established by the Government of Japan. The government aims to reduce environmental burdens by increasing energy-efficient next-generation vehicles (EV, FCV or PHEV) and strategically developing EV charging facilities or hydrogen stations, which are necessary for the spread. The use of this proceeds contributes to these measures.

[44] HEV (hybrid vehicles) are excluded.
[45] From the stage of obtaining fuels (a well) to the stage of actually driving (wheels) Regarding PHEVs and other vehicles that directly emit CO_2, the international initiative Climate Bonds Initiative (CBI) has set a tank-to-wheel (fuel tank to tire drive) threshold of 50g-CO_2/km/vehicle by 2025.

Consequently, JCR has evaluated that this use of proceeds is a measure to promote decarbonization in the automobile sector and is aligned with the Technology Roadmap for "Transition Finance" in Automobile Sector established by the Government of Japan to achieve NDC.

<Aviation sector>

Aviation emits CO_2 per transportation more than other public transportation (buses/railways)[46] and efforts to decarbonize aviation are essential to achieve carbon neutral. Demand for aviation has temporarily decreased due to the impacts of the new coronavirus infection; however, demand is expected to recover steadily in the future, and according to forecasts by the IEA/ICAO[47], both RTK[48] and RPK[49] are expected to increase continuously. Assumingly further decarbonization efforts will be required in the aviation industry in the future since the increases in demand for aviation will increase CO_2 emissions. Efforts to decarbonize aviation are accelerating globally; for instance, the long-term global aspirational goal (LTAG)[50] was adopted to reduce CO_2 emissions to practically zero by 2050 in the international aviation sector in the 41st General Assembly of ICAO held in October 2022.

In the process chart for promoting the decarbonization of aviation formulated by the Ministry of Land, Infrastructure, Transport and Tourism, the main measures to reduce CO_2 in the aviation sector are: (1) to introduce new technology to aircraft/equipment, (2) to improve operation methods by sophisticating the control, (3) to promote the introduction of SAF and (4) to implement carbon credits. The efforts for the use of this proceeds, in particular, supported by the government are assumed as follows: (1) the introduction of new technology for aircraft/ equipment and (3) the promotion to introduce SAF. Refer to the use of proceeds No. 4.2 for (2) to improve operation methods by sophisticating the control.

In the process chart for promoting the decarbonization of aviation, regarding (1) to introduce new technology to aircraft/equipment, the government is currently promoting to reduce weight/streamline equipment, and simultaneously R & D is to progress for realizing hydrogen aircraft and electric aircraft in its plan. It is expected to save energy by roughly 15 to 20 per cent

[46] 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.
[47] ICAO: International Civil Aviation Organization is a specialized agency of the United Nations established under the International Civil Aviation Convention (commonly known as the Chicago Convention) adopted in 1944 with the aim of cooperating with respective countries to ensure the safe and orderly development and the sound and economic operations of international air transport operations based on equality of opportunity.
[48] RTK: Revenue Ton-Kilometers The total distance traveled by transporting chargeable freight (including passenger weight.) Chargeable freight transportation weight (t) x transportation distance (km)
[49] RPK: Revenue Passenger-Kilometers. The total distance traveled by transporting chargeable passengers. The number of paid passengers (persons) x transportation distance (km)
[50] ICAO News Release at https://www.icao.int/Newsroom/Pages/States-adopts-netzero-2050-aspirational-goal-for-international-flight-operations.aspx

compared to the previous generation of equipment due to weight reduction using the latest composite materials, optimal design of wings or improvements in engine performance since aircraft equipment in general is developed/introduced at intervals of about 15 to 20 years[51]. In the GX Economy Transition Bond issued according to this framework, JCR has confirmed that in cases where proceeds are financed for fuel-efficient aircraft in the future, state-of-the-art aircrafts with energy-saving effects are covered but minor weight reductions although no projects targeting fuel-efficient aircraft have been recently assumed. Hydrogen and electric aircrafts do not emit CO_2 during operations since they do not use fossil fuels as power sources, and are listed as significant and innovative technologies or decarbonization in the IEA's "Net Zero Roadmap: A Global Pathway to Keep the 1.5 °C Goal in Reach." In Japan, the aforementioned technologies have already developed in the GI Fund's "Next-Generation Aircraft Development" project, and progress has been made smoothly, such as trial production tests for hydrogen burners alone have started or the system configurations around the engine has examined.

SAF is focused as an important role that enables decarbonization in large aircrafts that are difficult to electrify/hydrogenate. SAF refers to aviation fuels produced from sustainable sources, such as waste cooking oil other than fossil fuels, animal and vegetable oils and fats, and it can reduce CO_2 emissions by roughly 80 per cent compared to conventional fossil fuels.[52] The ASTM standards are presently classified into seven Annexes, based on the combination of raw materials of alternative fuels and manufacturing methods. Demonstration experiments or R & D are underway for SAF (PtL; Power to Liquid,) which uses CO_2 in the atmosphere and exhaust gases as raw materials although no SAF has yet obtained ASTM standards. From the viewpoint of raw material constraints, the Government of Japan plans to broadly support technological development, based on the concept that is necessary to address demand to be increased in the future and not to limit to one raw material/technology and to make the best use of domestic and overseas resources. It is assumed that the import costs of SAF from overseas (simple procurement costs) will not be covered since they will not contribute to increasing the industrial competitiveness/economic growth.

Accordingly, JCR has evaluated that this use of proceeds is a measure to strongly support the decarbonization in the aviation sector and that it is aligned with policies, such as the "Aviation Sector/Procedure Chart for the Promotion of Decarbonization of Aviation" established by the government to achieve NDC. SAF may also be financed through the use of proceeds No. 5.3 other than the category of the use of proceeds.

<Shipping sector>

[51]It is a numerical value that shows the general trend so far based on the manufacturer's published value and various interview and does not guarantee the fuel efficiency saving effects in future development.
[52]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.

Ships are divided into two categories: domestic shipping, which operates domestically, and international shipping, which operates in two or more countries. The GHG targets of each country, based on the Paris Agreement shall be followed for domestic shipping since the scope of operation is limited to Japan for the domestic shipping, and the targets agreed by the International Maritime Organization (hereinafter referred to as "IMO") shall be followed for international shipping. The IMO's GHG emission targets for international shipping are as follows:

[Outline of international shipping GHG emission reduction strategy]

In July 2023, the IMO's 80th Marine Environmental Protection Committee (MEPC80) was held in London, UK, and the targets were revised to be stricter for GHG emission targets.

Three goals were formulated, aiming to achieve them through measures (rules) prepared by the IMO.

1. To peak GHG emissions from international shipping as soon as possible and to reach net-zero GHG emissions by or around, i.e. close to, 2050
2. Uptake of zero or near-zero GHG emission technologies, fuels and/or energy sources to represent at least 5%, striving for 10%, of the energy used by international shipping by 2030
3. To reduce CO2 emissions per transport work, as an average across international shipping, by at least 40% by 2030, compared to 2008

The following guidelines for future reductions were annually presented to achieve the zero GHG emissions by around 2050.

1. Reduce GHG emissions by 20 to 30 per cent by 2030 (compared to2008)
2. Reduce GHG emissions by 70 to 80 per cent by 2040 (compared to 2008)

[Outline of domestic shipping GHG emission reduction strategy]

"Study Group for the Promotion of Carbon Neutral in Domestic Navigation" was established by the Ministry of Land, Infrastructure, Transport and Tourism in 2021 to compile and report on initiatives for zero-emission vessels in domestic shipping. Among them, a target to decrease 1.81 million tons-CO_2 in FY 2030 from FY 2013 was set forth as a CO_2 emission reduction target and description was made on the introduction of hull forms or energy-saving equipment and CO_2 emission reduction by fuel conversion with creative ideas during shipping.

[Ship schedule in the green growth strategy for carbon neutral]

In October 2020, the Government of Japan declared "carbon neutrality by 2050." To achieve this declaration, the METI has formulated "Green Growth Strategy for the Carbon Neutrality by 2050 ("Green Growth Strategy") in cooperation with relevant ministries and agencies. This

strategy is an industrial policy to lead the challenge of "carbon neutral by 2050" to "virtuous cycles between the economy and the environment." In this context, the shipping industry will acquire technological capabilities on the development of gas fuels, such as LNG, hydrogen or ammonia, which are essential for achieving zero emissions, and will lead the development of international standards, and the industry is aiming to increase the international competitiveness in Japan's shipbuilding/shipping industries and to work toward carbon neutral in marine transportation. The "schedule chart" by 2050 shown in the Green Growth Strategy consists mainly of three measures: (1) conversion to carbon-free alternative fuels, (2) higher efficiency of LNG-fueled ships and (3) development of international frameworks.

[Type of zero-emission ship]

Candidates for alternative fuels mentioned above include hydrogen fuel cells (hereinafter referred to as "hydrogen FC",) batteries (hereinafter referred to as "electric propulsion",) biofuels, ammonia fuel and hydrogen fuel.

1. Hydrogen FC

   Hydrogen FC refers to a fuel that extracts energy through chemical reaction of hydrogen and oxygen. It is a clean fuel without GHG emissions since water (H_2O) is produced after the chemical reaction. Hydrogen FC is a system suitable for use with short-distance/small ships due to power or capacity constraints. Currently, domestic companies are jointly developing medium-sized sightseeing ships for domestic use equipped with high-output fuel cells and are conducting R & D, aiming to carry out demonstration operations in 2024. The development of hydrogen FC ships, marine charging stations or marine fuel cell systems is also underway.

2. Battery (electric propulsion)

   A battery (electric propulsion) refers to a lithium ion battery, and a battery ship is powered by batteries. Two battery ships have already been practical use by Asahi Tanker. Battery ships can also be suitable for domestic shipping due to their battery capacities.

3. Biofuels

   Biofuels use bio-derived fuels as alternatives to fossil fuels, such as diesel oil, heavy oil or LNG. Biofuels have advantages with which the existing engines can be used as they are or by modifying at a small scale (drop-in fuel,) and the consideration to use as an alternative candidate for marine fuels is underway. Research on fuels to be used in diesel engines has been domestically progressing, which are mainly made from waste cooking oil.
   There are presently some cases where biofuels and heavy oils are mixed and commercialized, and demonstration experiments on biofuels are also conducted.

4. Ammonia fuels

Ammonia fuels, as the name suggests, are used ammonia as fuels for ships. Ammonia fuels are expected to be used for a range for overseas shipping as well as domestic shipping. Ammonia is toxic and corrosive, which should be handled with care although ammonia has relatively low flammable/explosive risks. Ammonia (NH_3) itself does not generate CO_2 even it is burned since ammonia does not have a carbon atom; however, it produces nitrous oxide (N_2O,) which has greenhouse effects that are about 300 times of that of CO_2. As a result, nitrous oxide treatment devices are required to install. In response to these issues, several domestic companies established standards for hulls/rigs/institutions of ships or rules for registering ship classifications and obtained basic design approval (AiP) for ships using ammonia fuels from the Japan Maritime Association (Class NK), which is the organization to inspect these standards or rules, or the development of tugboats with ammonia fuels and development of ammonia-fueled transport vessels are underway. It is therefore expected to spread ammonia fuels in earnest after the demonstration experiments in and after the 2030s.

5. Hydrogen fuels

Hydrogen fuels obtain its energy by directly combusting hydrogen. Liquefied hydrogen is stored in a tank in which it is vaporized and burned as for hydrogen fuels. The development of technology to properly store and burn hydrogen, a very light element, is an issue and R & D is currently underway for demonstration experiments. Kawasaki Heavy Industries is presently researching the technology for engines used as fuels by mixing hydrogen and low-sulfur fuel oil and obtained AiP for the basic design from Class NK. The engine will be installed on hydrogen carrying vessels scheduled to go into service in the late 2020s.

Subsidies for supporting capital expenditures in constructing supply chains required for manufacturing zero-emission ships are assumed as an example of the use of proceeds on this framework. JCR has evaluated that further promotion of manufacturing zero-emission ships will lead to the decarbonization of Japanese ships and enhancing Japan's vessel industry through building supply chains.

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 policy roadmaps, technology roadmaps＞
Policy roadmaps: Infrastructure, Regional and daily life

Use of proceeds No. 4.2 refers to support for equipment introduction, etc. to introduce port-related vehicles/equipment for decarbonization in port areas. The use of this proceeds falls under the category of "Clean Transportation" in the "Green Bond Principles," and "Project for clean transportation"in the "Green Bond Guidelines."

Ports in Japan are the bases for international supply chains through which 99.6 per cent of import/export cargos pass and also bases for coastal industries in which many of the power plants, steel or chemical industries locate, which account for about 60 per cent of CO_2 emissions and are major consumption bases for energy. In other words, the port areas are bases to import hydrogen or fuel ammonia, which are decarbonized energy, and there is a great room for CO_2 reduction by utilizing these energy. Therefore, conducting leading efforts intensively for decarbonization in the port areas are effective/efficient to realize the 2050 carbon neutral and as a result, Ministry of Land, Infrastructure, Transport and Tourism is promoting to creating CNP. CNP aims to reduce GHG emissions to zero as a whole through developing environments that can accept the import of large/stable/reasonable hydrogen/fuel ammonia or can store them or sophisticating port functions in consideration of decarbonization and collaborating with the coastal industries to be piled up in ports that are hubs and industrial sites for international logistics.

This use items of proceeds set forth transportation equipment without using fossil fuels as the eligibility criteria, and the environmental benefits is high since CO_2 emissions in using are zero. Specific projects include hydrogen fuels/electrification of cargo machinery/vehicles or hydrogen stations derived from renewable energy. CNP is also promoting projects in addition to clean transportation, such as solar/hydrogen power generation or LED lighting in factories, and if those projects are candidates for application, they will be allocated according to the adequate project classifications in this framework.

CNP formation will be promoted as a promotion of decarbonization logistics in the national Plan for Global Warming Countermeasures. JCR has evaluated that the use of this proceeds is also initiatives in line with the plan.

(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

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 CO2 emissions after electricity and heat distribution, we 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 key policy roadmaps, technology roadmaps＞ Policy roadmaps: Iron and Steel industry, Chemical industry, Cement industry, Paper and Pulp industry, Biomanufacturing Technology roadmaps: Iron and Steel sector, Chemical sector, Paper and Pulp sector, Cement sector
＜Examples of initiatives (overview, etc.)＞ ● 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 CO2 emissions. Establishment of direct hydrogen reduction technology to achieve over 50% reduction of CO2 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.

The use of proceeds No. 5.1 refers to R & D and support for equipment introduction, etc., aiming to reduce GHG emissions for the manufacturing industry, which accounts for the majority of CO_2 emissions after electricity/heat distribution. The use of this proceeds is categorized into "energy efficiency," "circular economy adapted products and production technologies and processes" in the "Green Bond Principles," and "Project for energy efficiency" and "Projects concerning eco-efficient products" in the "Green Bond Guidelines."

In the use of this proceeds, R & D or capital investment support will be carried out to reduce GHG emissions for the manufacturing industry, which accounts for the majority of CO_2 emissions after electricity and heat distribution. As a result, the government plans to have significant impacts for achieving the domestic GHG emission reduction target. The government will create markets in the new GX sector and expects to respond to the globally growing GX markets by launching the GX supply chain as soon as possible through this initiative.

The use of proceeds in each typical industry (steel, chemicals, paper/pulp, cement, automobiles) is shown below.

<Steel>

The method to produce steel from iron ore and coal (cokes) by reducing/melting them) in a blast furnace and a basic oxygen furnace (BOF),("blast furnace and BOF process") and the method to produce steel by melting steel scrap in electric arc furnaces ("direct reduction and electric arc firnace process") is commonly used in the steel industry. The blast furnace and BOF process is excellent in energy efficiency because reduction and melting are carried out consistently. y. In addition, as the range of utilization of iron ore is wide and the technology to remove impurities (the ingredient that affects a product, the same shall apply hereinafter) has been established, it is possible to produce high-quality steel. However, CO_2 emissions are inevitably generated since the use of carbon in the reduction process cannot be reduced to zero. The direct reduction-electric reactor process has low energy efficiency since it requires separate furnaces for reduction and melting, and the technology to remove impurities has not been established at this time; therefore, there are raw material constraints in producing high-quality steel. There is however no unavoidable CO_2 emissions since all reducing gases can be replaced with hydrogen. From the above, the followings are required to produce zero-carbon steel, (1) to process CO_2 inevitably generated by CCUS under the blast reactor-converter method with higher carbon-hydrogen reduction ratios, or (2) to use the direct dissolution-electric reactor method with 100 per cent hydrogen and renewable energy.

The assumed timeline is to introduce technology development for hydrogen reduction ironmaking in and after 2030 and to implement the technology to remove impurities in electric furnaces in the Technology Roadmap for "Transition Finance" in Iron and Steel Sector since technological innovation for hydrogen-reduced steelmaking and CCUS takes time. In the use of this proceeds, the R & D of hydrogen reduction ironmaking or measures to support capital investments for demonstration/commercialization are assumed and the "Hydrogen Utilization in Iron and Steelmaking Processes" project, which is already underway with the GI Funds is applicable.

<Chemical>

The chemical industry includes the petrochemical industry, which decomposes naphtha mainly obtained from petroleum refining to produce basic chemicals, such as ethylene or propylene, and polymerizes/oxidizes them and then processes them to obtain end-products, such as plastics as well as the soda industry, which manufactures products from caustic soda in which the salt of the raw material is electrolyzed. Since the chemical sector has a wide range of materials to handle, it is necessary to consider decarbonization technology tailored to each product or manufacturing process, but there are only three major measures: (1) fuel switching, (2) raw material circulation (recycling) and (3) raw material switching listed in the Technology Roadmap for "Transition Finance" in Chemical sector as follows:

(1) A typical measure related to fuel awitching is a technology that replaces fuels for heat utilization, such as ammonia-fueled naphtha crackers. In the petrochemical sector, since naphtha decomposition requires high a temperature of 850 °C, CO_2 emissions from the heat use are large, and technological development is underway for the fuel conversion to ammonia and hydrogen. (2) CO_2 emission can be largely reduced in raw material circulation (recycling) by utilizing biomass without CO_2 emissions or CO_2 itself as an alternative to naphtha. In the utilization of biomass, some parts have already begun to be introduced in basic chemicals, but there are still some parts that require technological development, such as expansion to synthetic products. In the utilization of CO_2, the government is currently in the stage of R & D and demonstration. (3) In the raw material switching, the promotion of chemical recycling or material recycling is listed[53]. Currently, only approximately 60 per cent of plastic waste (waste plastic) is recycled by thermal recycling, and 16 million tons of CO_2 are emitted per year. In the recycling of waste plastics, chemical recycling has the highest CO_2 reduction effects, but the introduction rate of chemical recycling is presently the lowest, so technological development of chemical recycling is promoted for future expansion.

It is also assumed to take measures to support the R & D from (1) to (3) and capital investments for demonstration/commercialization in the use of this proceeds. The project for the "Development of Technology for Producing Raw Materials for Plastics Using CO_2 and Other Sources" which has already been promoted with the GI Funds is applicable. In the utilization/circulation of CO_2 in (2) and (3), financing can be made with the use of this proceeds; however, financing can be made through the category of carbon recycling/CCS as well; therefore, please see the use of this proceeds No. 5.3 for more details.

<Paper/pulp>

The pulp manufacturing process consists of the preceding process of producing pulp using wooden chips and waste paper as raw materials and the following process of producing paper from pulp. In the preceding process, a large amount of heat and electricity is required in the process of chemically treating wood chips under the high-temperature and high-pressure to form fibers (digestion) and in the process of physically grinding chips. In the following process, a large amount of heat and electricity is required when pulp is diluted with a large amount of water (pulp 1: water 99) is skimmed, squeezed, and dried. It is currently promoting energy saving and efficiency improvement and introducing renewable energy while technology development is underway to convert heat to decarbonized fuels, including hydrogen, ammonia or biomass according to the Technology Roadmap for "Transition Finance" in Pulp and Paper sectors. Black

[53]The types of recycling are as follows. (1) Material recycling that is technology that produce new products from waste as raw materials without chemical decomposition. (2) Chemical recycling (raw materials/monomerization, blast furnace reducing agents, coke reactor chemical raw materials, gasification, oilification) that is technology that returns waste to raw materials by chemical decomposition and reuses it. (3) Thermal recycling (cement raw materials/converting into fuels, refuse-burning power generation, RPF, RDF, gasification, conversion into oil sources) that is technology to use as heat by fixing or converting into fuels. Of these, recycling in the chemical industry is focused in this item.

liquor (a type of biomass resources,) which is a byproduct of pulp making is already used for biomass; however, developing energy-efficient black liquor evaporation equipment is required.

The pulp and paper industry is considering expanding its "biorefinery" technologies to other industries, which uses the technologies of the pulp and paper industry for separating pulp and lignin[54] from wood, and produces chemical products from wood resources instead of chemical products derived from fossil resources. For instance, cellulose nanofiber composites, paper products as plastic substitutes, and bioplastic made from woody resources.

The government also assumes to take measures to support R & D on the development of heat source conversion and biorefinery technology or capital investments for demonstration /commercialization in the use of this proceeds.

<Cement>

The cement manufacturing process consists of three processes: (1) a raw material process in which raw materials (limestone) are dried/crushed/blended, (2) a baking process in which the blended raw materials are fired at a high temperature and rapidly cooled to produce an intermediate product, clinker, and (3) a finishing process in which gypsum is added to the clinker, crushed and finished in cement. The heat energy and electrical energy are used in each process, but the largest amount of energy used is in the baking process in which the limestone is fired at a high temperature of roughly 1,450 °C due to the decarboxylation of limestone. According to the Technology Roadmap for "Transition Finance" in Cement sector, the government is currently promoting energy conservation/high efficiency and using waste derived energy and is developing technology to convert to decarbonized fuels, such as hydrogen and ammonia.

CO_2 emissions however account for roughly 40 per cent of energy derived due to use of heat sources and electricity, and approximately 60 per cent of raw materials derived due to decarboxylation of limestone[55]in the conventional cement process. In the cement industry, the efforts to reduce CO_2 emissions derived from energy sources during manufacturing, such as switching to low-carbon heat sources and updating to high-efficiency and energy-saving equipment, are limited to about 40 per cent only. That is, carbon neutral cannot be realized in the cement industry, unless considering the standardization to increase mixed materials, which is an alternative to limestone, main raw materials, or the technology utilizing overseas mixed materials or practically utilizing the innovative technology, including low CO_2 cement or carbon cycles in reducing CO_2 emissions derived from raw materials. Therefore, the roadmap will also promote the development/implementation of technology, including CO_2 recovery.

[54]It is the main component of plant cell walls, and 20 to 35% of which is contained in wood by weight. It has the ideal properties of "heat-resistant," "easy to process" and "environmentally friendly."
[55]Decarboxylation reaction of limestone $CaCO_3 \rightarrow CaO + CO_2$

The government is mainly assumed to use this proceeds for the R & D of the innovative technology, including low CO_2 cement or carbon cycles. In the R & D on the carbon cycles, the use of proceeds No. 5.3 Carbon recycling/CCS category may be used. Please refer to the use of proceeds No. 5.3 Carbon recycling/CCS item for more details.

<Automobile>

Unlike the aforementioned four industries, The automobile industry is characteristic in that emissions from other companies related to business activities (Scope 3), specifically emissions from use of vehicles by users (about 80per cent), are greater than direct and indirect emissions from business activities (Scopes 1 and 2.) Therefore, measures for OEM, which is the supply side, (introduction and electrification of energy-saving equipment, support for research and development, etc.) as well as measures which change the demand of automobile users are important. In this framework, the measures for OEM, the supply side are positioned as the use of this proceeds, and the measures for users are positioned as clean transportation.

Although Scope 1 and Scope 2 in the automobile industry are smaller than Scope 3, Scope 1 and Scope 2 emit roughly 4.85 million tons-CO_2 per year. In the automobile manufacturing process, it is essential to decarbonize the manufacturing process through the reinforcement of energysaving measures in plants, greening of electricity used in plants, etc. since a lot of CO_2 is emitted in each phase, mainly the painting process. The current path includes promoting energy saving, low carbonization of fuels, use of renewable energy while converting to decarbonized fuels, such as hydrogen or utilization of CCS according to the Technology Roadmap for "Transition Finance" in Automobile sector. The R & D for fuel conversion is mainly assumed in the use of this proceeds.

In addition, the formed and fabricated materials industries such as the iron casting manufacturing industry, the forging manufacturing industry, and the metal heat treatment industry, which support these five major industries, also emit a lot of CO_2 emissions from the use of heat in the manufacturing process. CO_2 emissions in the formed and fabricated materials industries exceed 40per cent of those in the industrial sector. Since CO_2 emissions in the formed and fabricated materials industries are mostly derived from industrial furnaces for heating metals, R & D for decarbonization of industrial furnaces and capital investment for demonstration and commercialization are used in the use of this proceeds. Measures are also envisioned to support capital investment. Specifically, this is the development of technology related to conversion to zero-emission fuels such as ammonia and hydrogen, and conversion to electric furnaces.This includes the "Decarbonization of Thermal Processes in Manufacturing" project, which is already underway with the GI Funds.

Accordingly, JCR has evaluated that the use of this proceeds is a measure to support decarbonization in the manufacturing industry, which accounts for the majority of CO_2 emissions and is aligned with policies, such as technology roadmaps in each sector established by the Government of Japan to achieve NDC.

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 by 2050, efforts will be made over the next 10 years to establish a large-scale and robust supply chain (manufacturing, transportation, utilization) through the support system for supply chain development and the support system for base development ＜Related key policy roadmaps, technology roadmaps＞ Policy roadmaps: Hydrogen and ammonia Technology roadmaps: Power sector, Gas sector, Oil sector
＜Examples of initiatives (overview, etc.)＞ ● 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)

The use or this proceeds No. 5.2 refers to R & D and for equipment introduction, etc., to promote the introduction of hydrogen/ammonia. The use of this proceeds is categorized into "Circular economy adapted products and production technologies and processes" in the "Green Bond Principles," and "Projects concerning eco-efficient products, production technologies, and processes" in the "Green Bond Guidelines."

Hydrogen and ammonia are expected to be used in a wide range of sectors, such as power generation/transportation/industry, and will also contribute to a stable supply since it will contribute to increasing self-sufficiency rates or responding to fluctuations in output of renewable energy. The use of hydrogen/ammonia energy is expected to be used in technology roadmaps for various sectors, such as electricity, gas, automobiles, steel, cement, shipping or

railways, and the Government of Japan has positioned hydrogen/ammonia as one of the breakthrough energies for achieving carbon neutral.

In December 2017, the Government of Japan formulated the "Basic Hydrogen Strategy," a national strategy for ministries and agencies to work together for the first time in the world. In the "Basic Hydrogen Strategy" revised in June 2023 taking the subsequent 2050 carbon neutral declaration or domestic/international developments into consideration, the aims are up to 3 million tons/year in 2030 and about 12 million tons/year in 2040 and about 20 million tons/year in 2050 (including ammonia, hydrogen-equivalent) as a hydrogen introduction plan. The goals for costs are a supply cost of 30 yen/Nm^3 in 2030 and 20 yen/Nm^3 that is less than gas-fired power in 2050 by increasing the introduction amount. The government set a target in the higher 10-yen range/Nm^3, hydrogen-equivalent in 2030 for supply costs of ammonia.

Hydrogen with by-product hydrogen or through electrolysis of water generated in chemical plants are not enough to achieve the hydrogen introduction amount of 3 million tons/year in 2030. It is therefore essential to import CO_2-free hydrogen from overseas at reasonable costs and in large quantities. In order to achieve the hydrogen supply cost target, the important is to establish technology that enables to create large-scale demand for hydrogen and reduce supply costs by increasing the size of transportation facilities, including hydrogen carriers and by conducting demonstrations at actual equipment for hydrogen power generation (co-firing/single-firing.) The GI Funds are developing/demonstrating the construction of hydrogen supply chains, which are a series of flows of "manufacturing (hydrogen production/liquefaction,) transporting (hydrogen transportation,) storing (storage) and using (hydrogen supply and hydrogen use)." Technology has been developed for methylcyclohexane (MCH,) one of the hydrogen carriers that can utilize the existing petroleum infrastructure and hydrogen production from surplus electricity, which are examples of the target use of proceeds.

The government is considering a scheme to support the difference (partial or full) between the base price (price to obtain proper profits while recovering costs) and the reference price (parity price of the existing fuels) for a long period for hydrogen to be supplied by business operators concerning those operators who will start supplying low-carbon hydrogen by around 2030. CO_2 emissions for the Well to Production Gate[56] in producing 1 kg of hydrogen are 3.4 kg-CO_{2e}/kg-H_2 or less are set as low-carbon hydrogen as a standard for low-carbon hydrogen according to the calculation method of the International Partnership for Hydrogen and Fuel Cells in the Economy (IPHE.) This carbon intensity is based on 3.4 kg-CO_{2e}/kg-H_2 equivalent to the aforementioned in the EU Renewable Energy Directive[57] (RED), and 4 kg-CO_2e/kg-H_2 in the US Clean Hydrogen Production Standard[58] (CHPS.) JCR believes that the Government of Japan's low-carbon hydrogen standards compares favorably with the rest of the world. The government plans to review the standards for low-carbon hydrogen as necessary, taking future technological

[56]From raw material production to the outlet of hydrogen production equipment
[57]Stipulate obligations of renewable fuels supply by suppliers
[58]Hydrogen Hub Project Grant Adoption Criteria, U.S. Department of Energy (DOE)

progress into account. JCR has evaluated that this support scheme is also subject to the use of proceeds and promotes the transition toward hydrogen society in Japan. On the other hand, the EU Taxonomy[59] or the UK Low Carbon Hydrogen Standard[60] set stricter standards than the Government of Japan's low-carbon hydrogen; however, JCR considers that it is presently difficult to achieve their standards based on renewable energy costs in Japan.

R & D has been conducted for ammonia by the GI Funds. The R & D has developed technology necessary to reduce costs toward the target of supply costs or has established high co-firing/ single-firing technologies for use of ammonia in power generation toward the target of the introduction amounts. As same as hydrogen, a scheme is also planned to support the difference between the base price and the reference price. As a standard for low-carbon ammonia, the CO_2 emissions of Gate to Gate (including hydrogen production) when producing 1 kg of ammonia using hydrogen as raw materials are 0.84 kg-CO_{2e}/kg-NH_3 or less. This carbon intensity is set based on the situation in Japan while referring to overseas hydrogen standards. Currently, it is set based on Gate to Gate at the time of production only since there is no accurate data on CO_2 emissions, including the use of pipelines until natural gas is produced and supplied. The government plans to include CO_2 emitted from producing raw materials in the standards. JCR has evaluated that these efforts, which are subject to the use of proceeds, will promote the transition toward Japan's ammonia society.

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 the next 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 To ensure the annual storage capacity of CCS which is necessary for achieving carbon neutrality by 2050, efforts will be made to establish advanced CCUS value chains and CCUS markets in Asia, as well as establish CCS business laws as soon as possible and organize a business environment for business initiation by 2030 ＜Related key policy roadmaps, technology roadmaps＞ Policy roadmaps: Biomanufacturing, Carbon recycling fuels (SAF, synthetic fuels, synthetic methane), CCS, Resource circulation industry Technology roadmaps: Power sector, Gas sector, Oil sector

[59]A standard for sustainable finance to induce green investments
[60]British policy schemes used to determine grant eligibility

＜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

The use of proceeds No. 5.3 refers to R & D and support for equipment introduction, etc. for promoting the use of fuels that contribute to decarbonization, such as SAF, synthetic fuels or synthetic methane and securing annual storage amounts of CCS, which are necessary to achieve carbon neutral in 2050. The use of this proceeds is categorized into "Pollution prevention and control," "Circular economy adapted products, production technologies and processes and/or certified eco-efficient products" in the "Green Bond Principles."Also, it falls under the category of "Projects for pollution prevention and control" and "Projects concerning eco-efficient products, production technologies, and processes" in the "Green Bond Guidelines."

Carbon Recycling technology refers to a technology that considers CO_2 as a source of carbon, and promote capturing and recycling this material. Carbon dioxide (CO_2) will be recycled into concrete through mineralization, into chemicals through artificial photosynthesis, and into fuels through methanation to reduce CO_2 emissions into the atmosphere compared to the use of conventional fossil fuels, and it contributes to the realization of carbon-neutral society. CCS is a technology that separates/recovers CO_2 emitted from factories before diffusing to the atmosphere and stores/injects it deep under the ground. It is an important technology for achieving carbon neutral as corresponding to CO_2 that cannot be reduced with energy-saving/technological innovation only.

The Government of Japan listed (1) Carbon Recycling fuels, (2) Bio-manufacturing, (3) CO_2-reduction concrete and (4) CCS as efforts on Carbon Recycling and CCS in the GX Promotion Strategy and indicated policies to invest public and private funds to promote the development of these technologies. These technologies are also listed as important measures in the Technology Roadmap for "Transition Finance" in Oil sector, Power sector and Gas sector, and a "carbon recycling roadmap" was formulated and announced in June 2023.

1. Carbon Recycling fuels

Carbon Recycling fuel is an alternative to the fuels currently used in the transportation sector with CO_2 as raw materials, including synthetic fuels (e-fuel) produced from CO_2 and hydrogen as substitute liquid fuels for diesel oil or kerosene and biofuels made from biomass resources, such as SAF. Alternatives to city gas and LP gas include synthetic methane and synthetic LP gas produced from CO_2 and hydrogen. These can be used for existing infrastructure, facilities, and internal combustion engines. This type of fuel can keep decarbonization investment costs low, while having a positive effect for stable supply of energy by ensuring diversity in energy sources other than electricity.

2. Bio-manufacturing

Bio-manufacturing is to produce substances with cells, such as microorganisms or animals/ plants to use CO_2 as raw materials, utilizing the genetic technology. It is expected to be used in various industrial sectors, including chemical materials, fuels, pharmaceuticals, animal fibers or food. Specifically, it is a technology to produce useful substances, such as ethanol from CO_2 with the metabolic functions of organisms, including microorganisms and plants, or to grow/densify the cells themselves to form the bases of useful substances by using cells of animals. In that case, valuable materials can be made and productivity can be improved by editing or recombining genes or genomes in the existing cells.

3. CO_2 reduction concrete

CO_2 reduction concrete is concrete with fixed CO_2 in the process of manufacturing. Specific examples include concrete produced from cement with artificial limestone ($CaCO_3$) as raw materials from which CO_2 is adsorbed on calcium oxide CaO, and concrete produced from cement that reacts/hardens with CO_2. As detailed in the use of proceeds No. 5.1, the majority of CO_2 emissions in the cement manufacturing process are derived from raw materials; therefore, the absorption/reuse of CO_2 through this initiative is of significance.

4. CCS

As mentioned above, CCS is a technology that stores/injects CO_2 emitted from factories in the underground. The separated/recovered CO_2 is transported to the facilities where CO_2 is injected into the underground through dedicated pipelines or transport ships. The place where CO_2 is stored is a reservoir made of sandstone with many gaps, and it covers oilfields/gas fields in which the production have ended or deep salt water layers. The upper part of the reservoir must be covered with "shield layers" made of mudstone that is impermeable to CO_2. In Japan, large-scale demonstration tests were conducted in Tomakomai, and more than 300,000 tons of CO_2 were injected.[61]

In addition to the various technologies from (1) to (4) above, the use of this proceeds includes CO_2 Capture technologies, which are common to these technologies and the government assumes to take measures to support capital investments for technological development, demonstration/commercialization for manufacturing technologies, such as CO that is the basic substances of carbon-recycled products (including fuels,) H_2 synthetic gas, methanol or ethanol, and JCR has determined that these technologies are important for the proper management of residual CO_2.

[61] Japan CCS Co., Ltd at https://www.japanccs.com/en/business/demonstration/

Consequently, JCR has evaluated that the use of this proceeds is supporting carbon recycling that separates/recovers and uses CO_2, and is aligned with the Technology Roadmap for "Transition Finance" established by the Government of Japan to achieve NDC.

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

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 policy roadmaps, technology roadmaps＞ Policy roadmaps:　Food, agriculture, forestry, and fisheries industry

The use of proceeds No.6.1 refers to R & D for decarbonization in agriculture, forestry and fisheries. The use of this proceeds falls under the category of " Environmentally sustainable management of living natural resources and land use," "Circular economy adapted products and production technologies and processes" in the "Green Bond Principles," and "Project for sustainable management of living natural resources and land use" and " Projects concerning eco-efficient products, production technologies, and processe" in the "Green Bond Guidelines."

Japan's food industry/agriculture, forestry and fisheries industry are important since the industries themselves are absorption sources; for instance, the culture to utilize right wood in right places has been penetrated in Japan, and forests and wood/farmland/marine are expected to be huge CO_2 sinks. Japan's food industry/agriculture, forestry and fisheries industry has many potential strengths toward the realization of carbon neutral, such as the utilization of renewable energy that uses local resources, including land, water or biomass in agricultural, fishing and mountain villages, or CO_2 reduction through work optimization utilizing smart technology or N_2O reduction with proper fertilization.

In May 2021, the Ministry of Agriculture, Forestry and Fisheries formulated “Green Food System Strategy" as a policy to strategically tackle matters from a medium- to long-term perspective to improve the productivity and sustainability in the food and agriculture, forestry and fisheries industry through innovation. Based on this strategy, the government aims to gradually develop innovative technologies/production systems by 2040 and to socially implement them by 2050 in terms of labor reduction/productivity improvement, maximum utilization of local resources, carbon neutral, reduction of chemical pesticides/fertilizers and conservation/regeneration biodiversity for the entire supply chains, including procurement, production, processing/distribution and consumption.

Negative emissions that cover emission sources, which are difficult to achieve zero emissions are essential to achieve zero CO_2 emissions in agriculture, forestry and fisheries by 2050, and it is necessary to realize to store carbon in large quantities for long-term in forests and timber/farmland/marine.

For forests, which account for roughly 90 per cent of Japan's CO_2 absorption, the government strives to secure/increase the amount of forest absorption for a medium- to long term through appropriately thinning artificial forests, promoting reforestation after main logging while utilizing elite trees[62] and certainly creating young forests with high growth. For this reason, the government strives to efficiently develop elite trees or increase the production of their seedlings by speeding up forest tree breeding. At that time, the government aims to utilize seedlings with high growth, such as elite trees and it aims to use 30 per cent of forestry seedlings by 2030 and 90 per cent or more by 2050.

Wood produced from forests consumes relatively lower energy during manufacturing as well as stores carbon for a long-term. Regarding the use of wood, the government strives to switch to timber construction or to make people's living woody and to standardize the development/construction methods of wood-based building materials that contribute to timber construction of multi-story buildings and to establish a high-rise wooden technology by 2040. The government also strives to store carbon in large quantities for a long term by wood by using new materials, such as reformed lignin/CNF[63] or the subsequent development/practical use of new materials derived from wood.

Regarding carbon storage in agricultural land, the government will work to improve the functionality of biochar,[64] develop new biochar materials that have both carbon storage effects and soil improvement effects and to develop biochar standards and decomposition control technology.

[62]A fine tree with better growth, which is selected from the next generation of individual trees obtained through artificial mating between fine trees with good growth
[63]Cellulose nanofibers. Nano-sized fibrous substances taken from wood by chemical and mechanical treatment. It is one-fifth lighter than steel and five times stronger than steel.
[64]Carbide made from biological resources, such as charcoal or bamboo charcoal. It is specifically defined as "a solid substance made through heating biomass at a temperature of more than 350 degrees Celsius under an oxygen concentration controlled to a level that does not burn".

Of the above, the GI Funds are conducting R & D on "Development of isotropic large section materials that contribute to making high-rise buildings into timber construction" for switching to timber construction from multi-story buildings wood, and on "Establishment of technology for supplying/using high-performance biochar" for biochar.

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"

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 the next 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 policy roadmaps, technology roadmaps＞ Policy roadmaps: Resource circulation industry
<Examples of initiatives (overview, etc.)> ● 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 CO2 into the atmosphere, etc ➢ Criteria example: By 2030, establishing technologies that realize the waste incineration facilities based on CO2 separation and recovery, which ensures a stable carbon recovery rate of 90% or higher from waste under specific conditions

The use of proceeds No. 6.2 is to promote recycling-friendly design, R & D and support for equipment introduction, etc. that contributes to resource recycling, such as plastics or metals, sustainable aviation fuels, and equipment for establishing growth-oriented resource independence and a circular economy. The use of this proceeds include R & D that contributes to decarbonization in the waste sector and support to introduce equipment. The use of this proceeds is categorized into "Circular economy adapted products and production technologies and processes," "Pollution prevention and control" in the "Green Bond Principles," and "Project for circular economy adapted products and production technologies/processes," "Project for pollution prevention and control" in the "Green Bond Guidelines."

According to the United Nations (UN,) the world population[65] is expected to increase from 8 billion in 2022 to 9.7 billion in 2050, and economic growth or consumption increase are expected mainly in developing countries while the unit of global resources extracted[66] is expected to be more than double from 88 billion tons in 2015 to 183 billion tons in 2050 in the scenario analysis of the International Resource Panel (IRP.) Domestic and international waste problems are also becoming apparent, and the amount of global waste[67] is expected to increase from 14.12 billion tons in 2020 to 32.04 billion tons in 2050 according to Research Institute of Solid Waste Management Engineering.

Since the G7 Elmau Summit in 2015, discussions on circular economy or resource efficiency have been made in G7, G20, UNEP (United Nations Environment Program) and World Economic Forum and they were also discussed as important agendas along with climate change or biodiversity in the G7 Sapporo Climate, Energy and Environment Ministers' Meeting held in May 2023. In the meeting, the Circular Economy and Resource Efficiency Principles (CEREP), which is the conduct guidelines for the circular economy and resource efficiency of private companies was adopted, emphasizing the importance of companies' efforts when the international community is transitioned to a circular economy.

The Government of Japan announced the "Circular Economy Vision 2020" in May 2020 and formulated a "Growth-oriented resource-independent economic strategy" in March 2023, showing the challenges and directions for the Government of Japan to transition to a circular economy. The "Circular Economy Vision 2020" stated that the linear economic model of mass production/mass consumption/mass disposal with the global population growth and economic growth may not keep going sooner or later as the global economy, and that it is necessary to aim for lean growth in the medium to long term through circular economic and social activities (circular economy.) Furthermore, the government listed concerns about the future depletion of natural resources, such as metal resources along with the increases in global demand, and stricter treaties and regulations on the export of circulating resources (waste) and risks, including the situation of waste treatment in Japan in the "Growth-oriented resource independent economic strategy." While waste exports have nowhere to go and restrictions are imposed on the final disposal sites for waste in Japan, it is necessary to domestically utilize waste as recycling resources.

The "Basic Policy for the Realization of GX" shows the future milestones in the Resource circulation industry in which the government set forth its goals to be achieved by FY 2030 as follows: (1) Double the volume of recycled metal resource (discarded electronic substrates and batteries,) (2) Double recycled plastics, introduce 2 million tons of biomass plastic, (3) 10 per

[65] "World Population Prospects 2022" by United Nations (UN) at https://www.un.org/development/desa/pd/content/World-Population-Prospects-2022
[66] "Natural Resources for the Future We Want" by Global Resources Outlook 2019 at https://wedocs.unep.org/bitstream/handle/20.500.11822/27517/GRO_2019.pdf
[67] "Estimation of global waste generation and future forecast 2020 revised edition" by Research Institute of Solid Waste Management Engineering http://www.riswme.co.jp/cgi-image/news/52/file2.pdf

cent of aviation fuel used by Japan's airlines switched to SAF and (4) Build solar PV panel recycling facilities and reuse/recycling systems. The use of this proceeds to support the arterial industry includes: (1) Introduction of manufacturing facilities for products using low-/zero-carbon circulated resource (recycled/bio-based material,) (2) Introduction of manufacturing facilities for material-saving products, (3) Introduction of facilities for lease/sharing services. The use of this proceeds also includes as support for the venous industries like: (4) Introduction of metal/Lib/solar PV recycling facilities, (5) Introduction of plastic recycling facilities , and (6) Initiatives for producing/supplying sustainable aviation fuel (SAF) based on biomass waste and other eco-friendly material. It will be allocated for concrete support measures to achieve the above goals.

Roughly 40 million t-CO_{2e} (3.4 per cent[68]) of GHG emissions in Japan are emitted from the waste sector, which is the third sector after the energy sector and the industrial processes and use of products, and efforts to decarbonize this sector are urgent. In October 2023, the Ministry of the Environment announced the GI Funds' R & D/social implementation plan for "Achieving carbon neutral in the waste and resource recycling sector" as a precedent example of the use of this proceeds and plans to support for social implementation as follows: (1) to develop waste incineration disposal technology based on CO_2 separation/recovery, (2) large-scale demonstration of high-efficiency pyrolysis processing facilities for waste and (3) development of conversion technologies, such as high-efficiency biomethane using organic waste.

Consequently, JCR has evaluated that the use of this proceeds is measures to support the transition to a circular economy and decarbonized society aimed by the Government of Japan.

2. Negative impacts on the environment and society

Among the use of proceeds covered by this framework, R & D funds will be confirmed about whether there is any risks of negative impacts on the environment and society when examining respective R & D cost contribution and the mitigation measures will be made sure as needed. In implementing the subsidy program, the negative impacts on the environment and society will be identified based on laws and regulations, such as environmental impact assessment and the government will make sure that necessary mitigation measures are taken when individual business operators implement the program.

As described in Chapter 2 in this report, the avoidance of lock-in to fossil fuels, the fair transition and DNSH are appropriately considered, and additional/mitigation measures are considered as necessary.

In light of the environmental and social impacts, this framework set the following exclusion criteria.

[68] Greenhouse Gas Emissions Data in FY 2020 (Final Figures) in Japan by National Institute for Environmental Studies

- Projects involved in manufacturing, sale or distribution of mass destruction weapons such as nuclear weapons, chemical weapons, biological weapons, and inhumane weapons such as anti-personnel landmines and projects involved in manufacturing and providing services of products that support the manufacturing or sale of mass destruction weapons such as nuclear weapons, chemical weapons, biological weapons, and inhumane weapons such as anti-personnel landmines.
- Projects involved in mining, refining and transportation of coal
- Projects involved in the ownership or operation of gambling facilities or businesses
- Projects involved in forced labor
- Projects involved in unfair trade practices, bribery, corruption, extortion, embezzlement and other inappropriate relationships that do not comply with the laws of the country where they are located
- Projects involved in transactions that may cause human rights, environmental, or other social issues

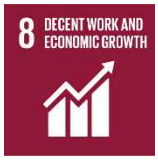
JCR has evaluated that all eligible projects take the negative impacts on the environment and society into consideration and that appropriate measures are taken.

3. Alignment with SDGs

JCR has evaluated that the government will contribute to the SDGs goals and targets below (in the following page) while referring to the ICMA's SDGs mapping.

Goal 7: Affordable and clean energy

Target 7.2: By 2030, increase substantially the share of renewable energy in the global energy mix
Target 7.3: By 2030, double the global rate of improvement in energy efficiency



Goal 8: Decent work and economic growth

Target 8.2: Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors
Target 8.4: Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-year framework of programmes on sustainable consumption and production, with developed countries taking the lead

Goal 9: Industry, innovation and infrastructure

Target 9.1: Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all

Target 9.2: Promote inclusive and sustainable industrialization and, by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances, and double its share in least developed countries

Target 9.4: By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities

Target 9.5: Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending

Goal 11: Sustainable cities and communities

Target 11.6: By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management

Goal 12: Responsible consumption and production

Target 12.5: By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse

Goal 13: Climate action

Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Goal 15: Life on land

Target 15.2: By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally

Goal 17: Partnerships for the goals

Target 17.17: Encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships

Evaluation Phase 2: Management, Operation and Transparency Evaluation

m1(F)

I. Selection Criteria and Processes of the Use of Proceeds

JCR's Key Consideration in This Factor

In this section, JCR will confirm the objectives to be achieved through this evaluation target, the adequacy of the green project selection criteria and processes, and whether a series of processes will be appropriately disclosed to investors.

▶▶▶ Current Status of Evaluation Targets and JCR Evaluation

An organization was established with cross-ministerial expertise for the goals, green project selection criteria and processes in this framework and the GX Implementation Council, chaired by the Prime Minister under the leadership of the Cabinet Office is appropriately involved, and all disclosures were made about these conference bodies and their operations; therefore, JCR has evaluated that the transparency is also ensured.

1. Goal

Basic Policy for the Realization of GX[69]

The main plans and laws and regulations to achieve carbon neutral in 2050 and a 46% reduction in GHG emissions in 2030 (from FY 2013) are as follows:

- Plan for Global Warming Countermeasures
- The 6th Strategic Energy Plan
- Basic Policy for the Realization of GX (GX Implementation Council)
- Act for Promoting a Smooth Transition to a Decarbonized Growth-Oriented Industrial Structure (GX Promotion Act)
- Act for Partial Revision of the Electricity Business Act and Other Acts for Establishing Electricity Supply Systems for Realizing a Decarbonized Society (GX Decarbonization Electricity Act)
- Strategy for Promoting Transition to a Decarbonized, Growth-Oriented Economic Structure (GX Promotion Strategy, included sector-specific investment strategies (roadmaps))

It is important for the Government of Japan to reduce CO_2 emissions from energy sources, which account for roughly 90% of GHG reductions. The Government of Japan discussed its specific reduction efforts in the GX Implementation Council, and the GX Promotion Act was enacted. The issuance of GX Economy Transition Bonds, which defines the use of proceeds in this framework, is a measure stipulated in Article 7 of the GX Promotion Act, and is clearly positioned as part of the Government of Japan's policy toward the realization of decarbonized society.

[69]Created by JCR from the basic policy for the realization of GX

2. Selection Criteria

The eligibility criteria in this framework are defined in the GX Promotion Strategy. The use of proceeds set out in this framework was included in the sector-specific investment strategies (roadmaps) however, the individual eligibility criteria (environmental benefits) will be examined in the working group with experts invited hereafter. JCR has evaluated that the project selection criteria are appropriate.

3. Process

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. Also, the "Government-Related Ministries and Agencies Liaison Conference on GX Economy Transition Bond Issuance" (Liaison Conference), which consists of director-level officials, confirms based on the compliance status regarding the adherence to eligible projects stipulated in "3.1 Use of Proceeds". During this process, if necessary, consultations are conducted with other relevant ministries, agencies, and related organizations, and the findings are reported to 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

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".

Evaluation by JCR to the Framework

In selecting projects that are eligible for the use of Japan Climate Transitino Bond proceeds, as set out in this framework, the alignment is to be confirmed in the liaison meeting with relevant ministries and agencies; therefore, JCR has evaluated that the process established in this framework is appropriate.

The Government of Japan's goals, selection criteria and processes for Japan Climate Transitino Bond are disclosed in this framework and this evaluation report. The Government of Japan plans to disclose the target projects on its website when issuing bonds based on this framework. Therefore, JCR has evaluated that transparency to investors is ensured.

II. Management of proceeds

JCR's Key Consideration in This Factor

It is usually assumed that the method of managing the proceeds financed widely varies depending upon the finance raisers. JCR will confirm that the proceeds financed based on this evaluation target are surely allocated to green projects, and that mechanisms and internal systems are in place so that the allocation can be easily tracked and managed.

JCR will emphasize whether the proceeds financed by this evaluation target are scheduled to be early used for green projects and it will also give importance to the evaluation of the management/operation methods of unallocated proceeds.

▶▶▶ Current Status of Evaluation Targets and JCR Evaluation

JCR has evaluated that the Government of Japan's proceeds management system has been properly established and is highly transparent since the method of managing the proceeds financed will be disclosed in this evaluation report and the framework will be disclosed on its website.

This framework on proceeds management

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 fiscal year[70] 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 Energy Supply and Demand Account in the Special Account for Energy Measures, separate from other accounts. Within this account, the budget related to GX (allocated projects) will be categorized, and 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.

Evaluation by JCR to the Framework

The proceeds financed by Japan Climate Transition Bond are managed separately from other accounts in the energy supply and demand account of the special account for energy measures,

[70] 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.

and the allocation project is classified separately as GX-related budgets even in the same account. Therefore, JCR has evaluated that the system has been established in which proceeds management is properly divided and managed.

The plan for proceeds allocation is, in principle, subject to projects whose operations will begin in and after the fiscal period concerned or proceeds was already allocated and all proceeds will be allocated in the fiscal period in question and in cases where unallocated proceeds are generated, they shall be managed in cash. Accordingly, JCR has evaluated the plan as adequate.

The management of proceeds financed will be inspected by the Audit Office, an independent body, in the same way as the normal budget process. The decision on the use of proceeds and the allocation will be confirmed in the liaison meeting with relevant ministries and agencies. The ledger on the management of proceeds financed will be retained until the repayment of the target bonds and the retention period based on laws and regulations.

Consequently, JCR has evaluated that the Government of Japan's proceeds management system has been properly established, and that the management method of the proceeds financed will be disclosed in this evaluation report; therefore, it is highly transparent.

III. Reporting

JCR's Key Consideration in This Factor

JCR will evaluate whether the disclosure system to investors before and after financing based on this evaluation target is planned in a detailed and effective manner in this section.

▶▶▶ Current Status of Evaluation Targets and JCR Evaluation

JCR has evaluated that the Government of Japan's reporting will be appropriately disclosed for both the allocation of proceeds and the environmental benefits to investors.

This framework on 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 Reporting for Proceeds Allocation

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 (or percentage) 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.

The initial report will be conducted within two years from the first 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

Evaluation by JCR to the Framework

Reporting on the allocation of proceeds

The Government of Japan will annually disclose the contents set out in this framework regarding the allocation of proceeds financed by Climate Transition Bonds on its website. In cases where any significant change is made in the financial situation after the full amount of the proceeds financed were allocated, the disclosure shall be made in a timely manner.

Reporting on environmental benefits

The Government of Japan plans to annually disclose the contents set forth in this framework on its website as reporting on the environmental benefits of eligible projects. These disclosure items will quantity the progress and the expected CO_2 reduction effects for R & D and the environmental benefits, such as the expected CO_2 reduction effects by implementing the subsidy program for the program in refining sectorial investment strategy and the disclosure will be made within the realm of possibility. The progress and environmental benefits for impact reporting will be updated at least until the end of the individual projects, and the information will be disclosed on the website for the repayment period.

Accordingly, JCR has evaluated that the reporting system by the Government of Japan is adequate.

IV. Efforts to Address Organizational Environmental Issues

JCR's Key Consideration in This Factor

JCR will evaluate whether the top finance raiser positions environmental issues as important issues with high management priority, or whether policies/processes/criteria for selecting eligible projects are clearly positioned by establishing divisions that specialize in environmental sectors or collaborating with external organizations in this section.

▶▶▶ Current Status of Evaluation Targets and JCR Evaluation

JCR has confirmed that the Government of Japan has positioned the realization of decarbonized society as one of Japan's important issues and has stipulated laws and regulations for the decarbonization of GX and power sources, and is working on it as an important priority issue for the government. JCR has evaluated in practical that a liaison meeting with relevant ministries and agencies has been established under the initiative of the GX Implementation Council, headed by the Prime Minister, and the government as a whole is working on it, and the GX Implementation Council and the working group responsible for the concrete examination of sector-specific investment strategies has invited experts from academic, financial and industrial sectors to build a system for repeated multifaceted examinations.

Please refer to Chapter 2 2.1 and 2.2 in this evaluation report for details on the current status of this evaluation target.

Evaluation Phase 3: Evaluation Result (Conclusion)

Green 1 (T) (F)

JCR assigned "gt1(F)" to the "Greenness/Transition Evaluation (Use of Proceeds)" and "m1 (F)" to the "Management, Operation and Transparency Evaluation" based on JCR Green Finance Evaluation Methodology. As a result, JCR assigned "Green 1(T)(F)" to the "JCR Climate Transition Bond Framework Evaluation." This framework meets the criteria for the items required in the Green Bond Principles, the Green Bond Guidelines, the Climate Transition Finance Handbook, and the Basic Guidelines on Climate Transition Finance.

		Management/operation/transparency evaluation				
		m1(F)	m2(F)	m3(F)	m4(F)	m5(F)
Greeness/ Transitionn 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)	N/A
	gt4(F)	Green 4 (T) (F)	Green 4 (T) (F)	Green 5 (T) (F)	N/A	N/A
	gt5(F)	Green 5 (T) (F)	Green 5 (T) (F)	N/A	N/A	N/A

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Important Explanation on this Evaluation

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

   JCR Climate Transition Finance Framework Evaluation provided by Japan Credit Rating Agency (hereinafter referred to as "JCR") covers the policies set out in the JCR Climate Transition Finance Framework Evaluation as an evaluation target and states JCR's comprehensive opinion on the extent to which allocation is made to the Green/Transition Project defined by JCR and on the degree to which the efforts to ensure the management, operation and transparency on the use of proceeds at present. It is therefore not intended to evaluate the specific environmental benefits and the management/operation system/transparency on the use of proceeds, such as individual bonds or borrowings implemented based on the policies. Separate evaluation is required to provide Climate Transition Finance Framework Evaluation for individual bonds or borrowings. JCR, in principle, does not directly measure the environmental benefits of proceeds financed through the green/transition finance framework although JCR confirms that the environmental benefits are quantitatively and qualitatively measured by an issuer or borrower (hereinafter the issuer and borrower are collectively referred to as a "finance raiser") or the third parties requested by the finance raiser.

2. Methodology Used in this Evaluation

   The methodology used to make this evaluation is posted as JCR Green Finance Evaluation Methodology in the Sustainable Finance/ESG section on the JCR's website at https://www.jcr.co.jp/

3. Relation with Conduct for Credit Rating Business

   The conduct of assigning and providing JCR Green Finance evaluation is performed by JCR as its related business and is different from the conduct for the credit rating business.

4. Relation with Credit Rating

   This evaluation is different from a credit rating and does not commit to providing a predetermined credit rating or make available for inspection.

5. Impartiality when Evaluating JCR Green Finance

   There are no capital or personnel relationships that could create a conflict of interest between this evaluation target and JCR.

Points to Consider

The information contained in this document was obtained by JCR from finance raisers and accurate and reliable sources. Such information however may be mistaken for artificial, mechanical or other reasons. Therefore, JCR makes neither representation nor warranty, express or implied, as to the accuracy, result, eligibility, timeliness, completeness, merchantability, or fitness for any particular purpose of such information, and JCR 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 damage of any kind, including any loss of money, which result from any use of such information under any circumstances, whether contractual liability, tort liability, negligence or other causes of liability, and whether such damage is foreseeable or unforeseeable. JCR Green Finance Evaluation does not express any opinion on various risks (credit risk, price fluctuation risk or market liquidity risk) on the green finance that is the subject of evaluation. JCR Green Finance Evaluation is a comprehensive opinion of JCR at present and does neither represent facts nor make any recommendation regarding risk assessments or decisions on the purchase, sale or holding of individual bonds or commercial paper. JCR Green Finance Evaluation may be modified, suspended or withdrawn due to changes in information or lack of information.

Terminology

JCR Climate Transition Finance Framework Evaluation: The assessment of the extent to which proceeds financed based on the Climate Transition Finance Framework are allocated to green/transition finance defined by JCR and the degree of management, operation and transparency related to the use of proceeds for the green/transition finance. The evaluation is made on a scale of five in the order from top to bottom with evaluation symbols, Green 1 (T) (F), Green 2 (T) (F), Green 3 (T) (F), Green 4 (T) (F), Green 5 (T) (F.)

Status of Registration as External Evaluator of Sustainability Finance

- Ministry of the Environment: Registered as External Reviewer of Green Finance
- ICMA (observer registration as an external evaluator with the International Capital Market Association)
- UNEP FI Positive Impact Financial Principles Working Group Member
- Climate Bonds Initiative Approved Verifier

Other Registration Status as Credit Rating Agency

- Credit Rating Agency: the Commissioner of the Financial Services Agency (Credit Rating) No. 1
- EU Certified Credit Rating Agency
- NRSRO: JCR registered with the following four of the five credit rating classes of the Nationally Recognized Statistical Rating Organization ("NRSRO") as defined by the U.S. Securities and Exchange Commission: (1) financial institutions, broker/dealers, (2) insurance companies, (3) general business corporations and (4) national/local governments. In cases where disclosure is required based on Rule 17g-7(a) of the Securities Exchange Act, such disclosure is attached to News Release on the JCR webpage at https://www.jcr.co.jp/en/.

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