



What's GX?

What is Green Transformation?

グリーントランスフォーメーション(GX)とは？

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What is Green Transformation (GX)?

The Japanese government started advancing “Green Transformation” (GX) branded initiatives in 2022. In May 2023, the Diet passed the GX Promotion Act and the GX Decarbonization Electricity Act (a bundle of amendments to several acts), and subsequently adopted the GX Promotion Strategy. By the end of 2023, the details of the funding and investment strategies for GX promotion were finalized.

What is GX? This report is a summary of its history and details.

I. What is GX?



01 Background

The government is promoting a “Green Transformation” (GX) as a strategy that will “transform our entire industrial and social structures centering around fossil energy sources, long established since the Industrial Revolution, into ones based on clean energy.”^{1,2}

The term “GX” began to attract attention after the Ministry of Economy, Trade and Industry (METI) released the “GX League Basic Concept” in February 2022.³ The GX League was established by the government to drive the transformation of social and economic systems and the creation of new markets, with the aim of achieving carbon neutrality by 2050. At the time of writing, 568 companies were involved.^{4,5}

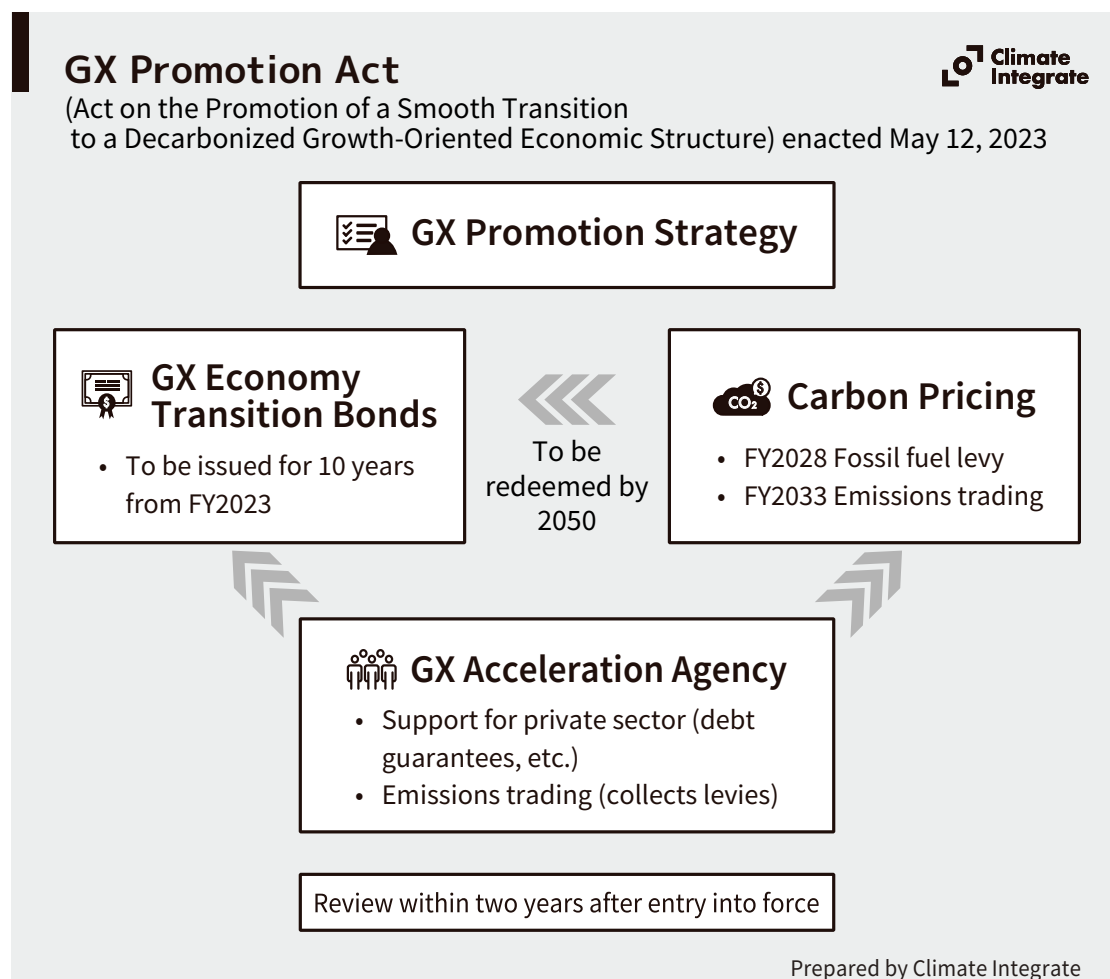
To promote GX, Prime Minister Fumio Kishida announced his plans of marshalling more than 150 trillion yen (\$1 trillion) of public and private investment including 20 trillion yen (\$130 billion) of government investment over the next ten years (\$1=150 yen). Various steps have been taken, including adoption of the GX Basic Policy, enactment of the GX Promotion Act, adoption of the GX Promotion Strategy, formulation of the rules for phase one of an emissions trading system (GX-ETS), and adoption of frameworks for sector-specific investment strategies and GX Economy Transition Bonds (“the Bonds”). The government also created an online “GX dashboard” to share member companies’ information on their emissions targets, actual emission reductions, and participation in emissions trading.⁶

02 GX Promotion Act

In February 2023, the government adopted the “Basic Policy” for the realization of GX, which sets out policies and a roadmap for the next ten years.^{7,8} The Diet enacted the GX Promotion Act in May 2023.⁹ The Basic Policy was amended to become the GX Promotion Strategy, which was approved by the Cabinet in July 2023.¹⁰ In this way, GX promotion has taken shape as a government initiative underpinned by legislation. The GX Promotion Act stipulates the following:

- Development and implementation of GX Promotion Strategy
- Issuance of GX Economy Transition Bonds
- Introduction of carbon pricing
- Establishment of the GX Acceleration Agency
- Progress assessment and revisions as required


Around the same time as the GX Promotion Act’s passage, the Diet also passed the GX



Decarbonization Electricity Act, containing a bundle of amendments to several acts.¹¹ The legislation calls for grid improvements and additional renewable energy investments, and also revises regulations on the allowed service life of nuclear power plants (set at 40 years in principle, but can be extended to 60 years under certain conditions, and shutdowns beyond the operator’s control are excluded from the time count).

GX Promotion Strategy

The GX Promotion Strategy states that GX “represents a major shift from postwar industrial and energy policy.” Two key components of the Promotion Strategy are a “stable energy supply” and “growth-oriented carbon pricing.”

Core components of GX Promotion Strategy 	
Stable energy supply	Growth-oriented carbon pricing
<ul style="list-style-type: none"> • Energy efficiency, renewables • Nuclear power • Others (hydrogen/ammonia/LNG procurement/carbon recycling to fuel, etc) 	<ul style="list-style-type: none"> • 150 tn yen (\$1 tn) in public-private investment for 10 years, including 20 tn yen (\$130 bn) upfront investment by the government • Carbon pricing measures • Asia Zero Emissions Community (AZEC)
Prepared by Climate Integrate	

GX Economy Transition Bonds

The government will issue GX Economy Transition Bonds and make upfront investments in priority sectors. In November 2023, the government announced plans to issue such bonds as “Japan Climate Transition Bonds” based on the “Framework,”¹² which provides criteria for use of proceeds in accordance with the principles and guidelines of the International Capital Market Association (ICMA) and others. In the first issuance, the government intends to invite bids totaling 1.6 trillion yen, consisting of 800 billion yen in 10-year bonds (February 14, 2024) and 800 billion yen in 5-year bonds (February 27, 2024).¹³

The Framework provides “eligibility criteria” based on energy supply and demand, and “eligible projects” for typical use of proceeds. It also specifies requirements for “impact reporting” of CO₂ emission reductions and project progress. The government has received Second Party Opinions (SPO) from Norway’s DNV and the Japan Credit Rating

Agency (JCR) stating that the Framework meets the criteria set by ICMA and others.¹⁴ The government aims to attract 130 trillion yen in private investment, using the issuance of 20 trillion yen of the Bonds over the next ten years as a catalyst.

Growth-oriented Carbon Pricing

The government's plan is to introduce mechanisms to put a price on carbon emissions, referred to as "growth-oriented carbon pricing," for the redemption of the Bonds. There are two approaches to this carbon pricing. One is to collect a carbon levy (fossil fuel levy) from fossil fuel importers starting in FY2028. The other is that power companies will participate in auctions starting in FY2033 to procure emission allowances. This has all been stipulated in legislation, including the years of introduction.

While not stipulated in the legislation, a voluntary emissions trading system (GX-ETS) was established in FY2023. Under the rules for phase one (FY2023 to FY2025), it is up to companies to decide whether or not they wish to participate, and they can also set their own targets.¹⁵ The government is considering mandatory participation as a condition for receiving support through the Bonds,¹⁶ but it is expected that the system will remain voluntary.

Framework of GX Economy Transition Bonds and Carbon Pricing



GX Economy Transition Bonds

- Starting FY2023, the Bonds are to be issued, totaling approx. 20 tn yen for 10 years, with aim of over 150 tn yen in public and private investment.

Carbon Pricing

Emissions trading system

- Established in FY2023 on voluntary basis, full-scale operation in FY2026
- In FY2033, introduce auctions for power generation companies.

Carbon levy

- In FY2028, introduce as a levy for fossil fuel importers.

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03 Sector-specific Investment Strategies

The government convenes the GX Implementation Council where policies are determined by the relevant ministers and experts. Following the release of the “Sector-specific Investment Strategies”¹⁷ by the Council in December 2023, the government plans to promote investment in technologies that will reduce emissions in high-emission sectors, especially those that will be effective in strengthening industrial competitiveness and economic growth. As of the end of 2023, the uses of approximately 13 trillion yen were indicated (see table on page 8).

04 Tax Credits in Strategic Sectors

The government is also considering introducing new tax credits based on production volume, targeting electric vehicles, green steel, green chemicals, and sustainable aviation fuel (SAF).¹⁸ Under the plan, target sectors needing strategic attention would be specified under the Act on Strengthening Industrial Competitiveness, and among them, the plan would be for GX-related sectors to utilize financial resources procured by the Bonds. Also being considered are corporate tax deductions of up to 40% for up to ten years after approval of a business plan (plus a carry-forward of up to four years).

Column GX Implementation Council

The government set up the GX Implementation Council in July 2022. This Council, chaired by the Prime Minister, receives, approves and adopts major proposals on GX basic policies and strategies from the Minister of Economy, Trade and Industry and other ministers. Public disclosure of details of the discussions at the Council is limited.



Table: Sector-specific Investment Strategies for GX Economy Transition Bonds

		Public + private investment (trillion yen)	Major proposed investments based on GX Economic Transition Bonds
Manufacturing	Steel	>3	<ul style="list-style-type: none"> Support for capital investment to transform manufacturing processes (conversion to innovative electric furnaces, ammonia as a heat source for cracking furnaces, chemical recycling, bio-chemicals, CCUS, bio-refineries, etc.)
	Chemicals	>3	
	Pulp & paper	>1	
	Cement	>1	
Transportation	Automotive	>34	<ul style="list-style-type: none"> Support for introduction of electric vehicles (passenger) Support for introduction of electric vehicles (commercial)
	Batteries	>7	<ul style="list-style-type: none"> Support for introduction of production facilities Support for introduction of stationary storage batteries
	Aircraft	>4	<ul style="list-style-type: none"> Development of core technologies for next generation aircraft
	SAF	>1	<ul style="list-style-type: none"> Support for sustainable aviation fuel (SAF) manufacturing and supply chain development
	Ships	>3	<ul style="list-style-type: none"> Support for introduction of production facilities for zero-emission vessels
Housing/ lifestyle	Housing/ lifestyle	>14	<ul style="list-style-type: none"> Upgrading to insulated windows Introducing energy-efficient water heating Support for renovation of buildings (commercial/educational facilities, etc.)
	Resource recycling	>2	<ul style="list-style-type: none"> Support for building recycling-oriented business models
	Semi-conductors	>12	<ul style="list-style-type: none"> Support for introduction of production facilities for power semiconductors, etc. Support for technology development (AI semiconductors, photonics-electronics convergence, etc.)
Energy	Hydrogen, etc.	>7	<ul style="list-style-type: none"> Support focused on price differences between conventional and new fuel raw materials Establishment of supply bases for hydrogen, etc.
	Next generation renewable energy	>31	<ul style="list-style-type: none"> Support to establish supply chains for perovskite solar cells, floating offshore wind power, electrolysis equipment. Support for introduction of perovskite solar power
	Nuclear	>1	<ul style="list-style-type: none"> Development and construction of next-generation innovative nuclear reactors
	CCS	>4	<ul style="list-style-type: none"> Support to build CCS value chains (development of suitable sites, etc.)
Cross-sectoral measures			<ul style="list-style-type: none"> Promotion of investment through energy-saving subsidies, including for small and medium-sized enterprises
			<ul style="list-style-type: none"> Support to foster deep tech startups
			<ul style="list-style-type: none"> R&D by GI Fund, etc.
			<ul style="list-style-type: none"> Financial support by GX Acceleration Agency for GX implementation
			<ul style="list-style-type: none"> Regional decarbonization subsidies (independent microgrids, etc.)
Tax measures			<ul style="list-style-type: none"> Establishment of new tax credits based on production volume of green steel, green chemicals, SAF, EVs, etc.

Source: Prepared by Climate Integrate based on [METI Sector-specific Investment Strategies](#) (p.11).

II. Key Issues about GX

As described above, the GX promotion framework was formed over a short period of time with the aim of securing large-scale investment and the financial resources to support the investment. It is backed up by legislation, and is being actively promoted by the government. Major initiatives are evident elsewhere, such as in the United States and the European Union, to direct massive investments into decarbonization efforts. However, GX is unique to Japan in terms of its mechanisms and details, and many issues with Japan's approach have been raised.^{19,20,21} Below is a summary of some of those issues.



Doubts about alignment between GX and carbon neutrality goals

- The focus of GX is on industrial promotion. While the government has provided domestic reduction targets for each sector for the next 10 years, it has given no clear indications of the expected climate benefits of implementing GX or prospects for actually reducing greenhouse gas emissions. For example, to what extent will Japan's GX initiatives be consistent with the 1.5°C goal under the Paris Agreement? Is GX aligned with Japan's 2030 targets or its goal of carbon neutrality by 2050? What about alignment with Japan's G7 commitment to decarbonize the power sector by 2035? None of this is clear, so it is impossible to measure progress.

- Major sectors targeted to benefit from more than 150 trillion yen of public and private investment include automotive, storage batteries, and renewable energy. At the same time, however, funding is also being targeted toward technologies that are debatable in terms of suitability including hydrogen and ammonia co-firing with coal- and LNG-fired power generation, as well as so-called next-generation nuclear power, and carbon capture and storage technologies (CCS), etc. Furthermore, no evidence has been presented that would help to objectively evaluate the validity of each technology in terms of alignment with the 1.5°C goal, or emission reductions, or cost-effectiveness of each project.



GX perpetuates Japan's reliance on fossil fuels and nuclear power

● GX is based on the premise that Japan will continue to rely on thermal power generation, and promotes what the government refers to as “zero-emission thermal power” through the co-firing of coal or LNG with hydrogen or ammonia, or hydrogen-only or ammonia-only firing. In order to be consistent with the 1.5°C goal, it is necessary to achieve net-zero in the power sector by 2035. However, these technologies are still unproven and extremely expensive, and there is almost no likelihood that they would actually reduce emissions by 2030.²² In addition, the likelihood of commercialization of these technologies is difficult to predict, so promoting co-firing or 100% hydrogen- or ammonia-firing for power generation will likely end up keeping thermal power plants operating longer.

● Japan's policy to reduce its reliance on nuclear which had been in place since the Fukushima Daiichi Nuclear Power Plant accident in 2011, was changed dramatically in 2023 to enable nuclear plants to operate for more than 60 years. The government also intends to develop and build “next-generation innovative reactors” under GX. However, no assessments have been provided to help verify the economic viability of new reactors or their potential contribution of CO₂ emission reductions to the 1.5°C goal.

● In terms of renewable energy, while GX places some importance on developing new technologies such as floating offshore wind and perovskite solar power generation, it provides almost no incentive to deploy solar and wind power that uses existing technologies, including commercial-scale solar whose installations have been slowing down in recent years.²³ The government plans to set targets for floating offshore wind, and setting ambitious targets could signal prospects for expansion (note: Japan has the offshore wind development target of 30-45 GW by 2040, which does not specify the breakdown of floating and fixed-bottom offshore wind).²⁴

● Japan's continued dependence on fossil fuels and nuclear power will perpetuate its national expenditures for imported energy resources such as coal, gas, and uranium and also encourage further fossil fuel development and lock in fossil fuel infrastructure in countries in Asia and the Middle East, as well as the United States, Canada and Australia. Thus, Japan's GX could stymie decarbonization efforts in other countries and divert finite investment resources away from renewables.



Adequacy and credibility of projects to be invested by GX Economy Transition Bonds

● While the Bonds may provide opportunities to attract private investment to promote decarbonization in Japan, there is also a risk of greenwashing²⁵ as described below:

- Projects that are questionable in terms of alignment with the Paris Agreement's 1.5°C goal with regards to CO₂ emission reductions and timelines are among those considered eligible for use of proceeds (ammonia and hydrogen co-firing technology for thermal power generation, carbon recycling, CCS, etc.).
- The Bonds can be issued even before use of proceeds (eligible projects) has been decided,²⁶ so there is a risk that investments may be made without enabling investors to make accurate evaluations. For the first issuance,

the government has picked eligible projects (mostly those in FY2022 budget allocation).²⁷ But of the 1.6 trillion yen Bonds to be issued, about 360 billion yen, or 23% of the total, has not been allocated to specific projects.²⁸

- The information to be disclosed in reporting can be either on an individual project or eligibility criteria basis,²⁹ so reporting may not be sufficient enough for stakeholders to evaluate the CO₂ emission reductions of different projects within the same eligibility criteria.

● The challenge going forward will be to ensure that investors can more accurately evaluate consistency with the 1.5°C goal, and ensure the adequacy and credibility of projects to be invested by the Bonds.



Carbon prices set too low, implementation too slow

● Carbon pricing is being introduced as a source of funds for the redemption of the Bonds. Based on the anticipated scale of 20 trillion yen over ten years, it is assumed that the carbon price will be set at the rate of about 1,500 yen per ton of CO₂.³⁰ This level is lower than that

of other major countries and compared with benchmarks such as EU ETS' around 15,000 yen per ton of CO₂ and is not sufficient to provide a price incentive.³¹

● The first auctions are scheduled for about ten years in the future, in FY2033,

evidence of a lack of a sense of urgency as a response to climate change. In the meantime, although stricter rules are being considered,³² the emissions trading system is being left to voluntary efforts, and it is unclear whether the system will function adequately and achieve emission reductions.

- Starting in FY2028, fossil fuel

importers will be subject to a carbon levy, but unlike a carbon tax, a levy does not require the involvement of the Diet. Going forward, the challenge is to ensure that proper debates take place about the most appropriate carbon pricing mechanisms (e.g., about the effectiveness of pricing/levies/taxes on emission reductions and how carbon pricing revenues should be used).



Extensive powers given to METI

- The system is designed to give METI significant influence over decision-making and implementation of GX. For example, the GX Promotion Act gives only METI the authority to formulate the GX Promotion Strategy. METI is also responsible for the establishment and operation of the GX Acceleration Agency. Extensive decision-making and administrative powers have been concentrated in METI, resulting in a situation where checks and balances cannot function properly.

- GX measures are discussed at the GX Implementation Council, chaired by the Prime Minister with invited experts also participating. METI is effectively in charge of the process with its minister also serving as the Minister for Green Transformation. The policy

formulation process including details of deliberations is not transparent, and crucial policies tend to be decided by the government and ruling parties making it often difficult for diverse opinions to be reflected.

- GX focuses mainly on corporate “subsidies,” and METI has great control over determining which technologies receive subsidies and on what scale. The current approach emphasizes the development of costly and novel technologies, while largely overlooking projects that would broadly benefit the public interest, such as the greater adoption of existing technologies like low-cost photovoltaic power generation, incentives for energy efficiency, or support for a just transition through industrial transformation.



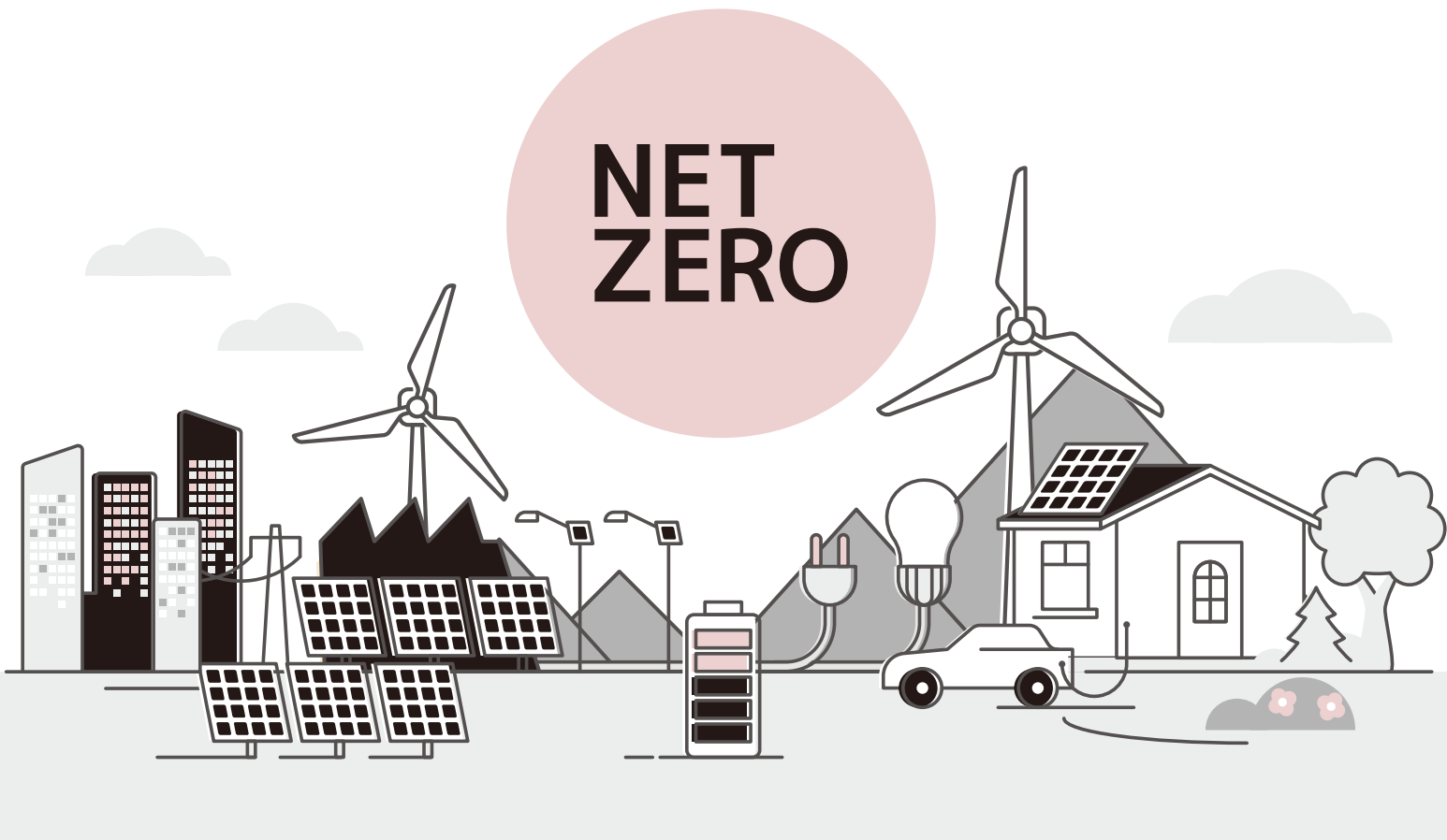
Aggressive rollout in Asia

● The government is also promoting GX in the Association of Southeast Asian Nations (ASEAN) countries through the Asian Zero Emission Community (AZEC), which is being led by Japan. Through the promotion of technologies such as co-firing with ammonia or hydrogen in thermal power plants and other technologies that are questionable in

terms of their alignment with the Paris Agreement, the problems with Japan's GX could also spread to other Asian countries. GX could have other negative impacts, such as unraveling efforts of the Just Energy Transition Partnership, which aims for a just transition away from coal in countries such as Vietnam and Indonesia.



III. Looking ahead



As described above, Japan's "Green Transformation" (GX) is being promoted jointly by the government and private sectors as a made-in-Japan concept, with the government as the flagbearer. It is a mechanism to enable new investment on a massive scale, but there is no evidence or assurance that GX schemes will result in carbon neutrality for Japan. The promotion of unproven technologies and the lack of urgency in introducing carbon pricing may fail to produce steady reductions in greenhouse gas emissions.

The direction of GX-related policy, strategy, investment and allocation of funds was determined over a very short time frame. To ensure alignment with the Paris Agreement and the 1.5°C goal, climate and energy policy going forward should not be solely based on decisions made by the government and ruling parties. We need to see data-driven, objective deliberation and debate about the likely emission reductions and suitability of each measure and technology as well as the optimal design of carbon pricing. It is also crucial to enable public participation while ensuring adequate debate with the meaningful participation of citizens in transparent processes.

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