Kanadevia

Technology for people and planet

Kanadevia Corporation

TNFD Report 2024

October 2024

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Introduction

Kanadevia Group is committed to develop the sustainable society, guided by the brand concept of "Taking on the challenge to create a world that lives in balance with nature through the power of technology." Since its establishment in1881, "Osaka Iron Woks" has evolved from its origins in shipbuilding to encompass a diverse portfolio of businesses, including Environment Business, Machinery and Infrastructure Business, and Carbon Neutral Business. Throughout this period, the Group has consistently provided technologies that support the development of society. Our corporate philosophy is based on the principle of leveraging technology to address social issues.

Kanadevia's *Sustainable Vision*, "*Realize zero environmental impact*" and "*Maximize people's well-being*," reflects our determination to address ongoing challenges in a way that will enable us to achieve a society where we can live in peace and a healthy global environment until 2050. According to the concept of "Planetary boundaries[1]", which delineates the safe operational area for humanity its limitations, the global environmental resilience will be maintained as long as human activity remains within the limits. The Group has identified "*Maximize environmental resilience*" as *pillars of success* (Materialities) . The Group defines "*Realize zero environmental impac*t" as maintaining the environmental impacts of our own business activities, our supply chain and our customers, within the range of the country/region's inherent environmental resilience. In the following, "zero environmental impact" is described as "net-zero environmental impacts within Planetary boundaries." To maintain the environmental impacts caused by human activities within the bounds of the global environmental resilience, we will actively develop businesses and technologies while reducing the environmental impacts of our own business activities. This will contribute to a reduction in the environmental impacts of our business partners and customers.

In October 2024, the Group will take a new step from Hitachi Zosen as Kanadevia. "Kanadevia" means to tackle difficult challenges as a team and pave the way, just like an orchestra playing harmony. Kanadevia will collaborate with all stakeholders, including employees, customers, business partners, shareholders and investors, local communities, and international organizations, to address increasingly critical social issues such as climate change, loss of biodiversity, and human rights violations, and contribute to the realization of a prosperous future.

October 2024

Representative Director
Chairman and CEO Sadao Mino
Representative Director
President and COO Michi Kuwahara

[1] Planetary boundaries are boundaries proposed by the Stockholm Resilience Centre that show the limits of the range within which the Earth's environment can return to its original state and remain stable even if changes (especially human influences) are made to the Earth's environment. Nine processes have been proposed: climate change, biodiversity loss, biogeochemical cycles, ocean acidification, land use change, freshwater, ozone holes, atmospheric aerosol particles, and chemical pollution.

1. Kanadevia Group's approach to natural capital

In March 2023 , Kanadevia Group formulated its “*Sustainable Vision”*, which outlines the Group’s environmental and social goals for 2050. The vision includes two key objectives: "Realize zero environmental impact” (hereinafter referred to as “*Realize net-zero environmental impacts within Planetary boundaries*") and "*Maximize people's well-being*."[2] This vision embodies the core values of the Group, based on the Four Principles of Sustainability[3]. The seven *pillars of success* (Materialities) that have been established as essential elements for realizing the vision include, in addition to "*Carbon neutrality*," "*Complete circulation of resources*" and "*Maximize environmental resilience*," which are closely related to natural capital , as well as "*Response to intensifying natural disasters*" and "*Sustainable procurement*."

Natural capital refers to the global environment and natural resources, such as plants, animals, air, water, and soil. Human life is dependent on natural capital, and the damage to natural capital has ripple effects throughout the value chain, impacting the environment, society and economy, and ultimately human life. This report focuses on our global Waste to Energy (WtE) business[4] and biomass power generation business, taking into consideration business scale, impact on natural capital, and evaluability in the business areas outlined in our medium-term management plan (hereinafter, the WtE business and biomass power generation business are collectively referred to as "WtE Business"). In these businesses, the customer’s decision-making has significant and variable impacts on the level of direct involvement with natural capital. In this business, we are entrusted with the engineering, procurement, and construction (hereinafter, collectively referred to as "EPC") of the WtE facilities (including other related facilities), and then hand them over to the customer, so the environmental performance and specifications of the WtE facilities are based solely on the customer's requirements. The loss of natural capital, including biodiversity, may therefore increase uncertainty in our customers' businesses.

In December 2023 , Kanadevia expressed its support for the information disclosure recommendations of the Task Force on Nature-related Financial Disclosures (hereinafter referred to as "TNFD") and registered as a TNFD Early Adopter. In the future, the Group will strive to proactively disclose information based on the TNFD information disclosure framework, and as a plant engineering company for the WtE facilities, the Group will utilize environmental technologies, improve procurement, and improve the environmental quality of our proposals to

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[2] Integrated Report 2023 p16 (https://www.kanadevia.com/ir/data/pdf/ir2023_J_A4.pdf)

[3] The Four Principles of Sustainability are principles for business activities that focuses on the four root causes of unsustainable conditions, and are advocated by the international NGO The Natural Step (https:/thenaturalstep.org/approach/). Specifically, they are as follows:
In a sustainable society, nature is not subject to systematically increasing…
(1) … concentrations of substances from the earth’s crust;
(2) … concentrations of substances produced by society;
(3) … degradation by physical means;
and in that society, people are not subject to conditions that …
(4) … systematically undermines their capacity to meet their needs. (health, influence, competence, impartiality and meaning)

[4] The WtE Business can be categorized into waste incineration power generation and biogas power generation (including fuel conversion and hydrogen utilization).

customers. This is because we believe that working to appropriately conserve and restore natural capital in the value chain will strengthen social infrastructure and enrich human lives.

With this report as a starting point, we will continue to engage in dialogue with everyone across the value chain and continue to look to for ways to contribute to maximizing the environmental resilience of the global environment itself.

This report was created with reference to the TNFD Final Recommendations v1.0, published in September 2023.

2. General Requirements

2.1 Application of materiality

This report is based on the disclosure in accordance with the financial materiality standards, but also discloses information regarding natural capital in accordance with the impact materiality standards.

2.2 Scope of disclosure

The Group conducts business in three areas: Decarbonization, Resource circulation, and Safe and prosperous community. In the field of Resource circulation, we are the world's largest plant engineering company for the WtE facilities , and have installed more than 1,500 facilities around the world.

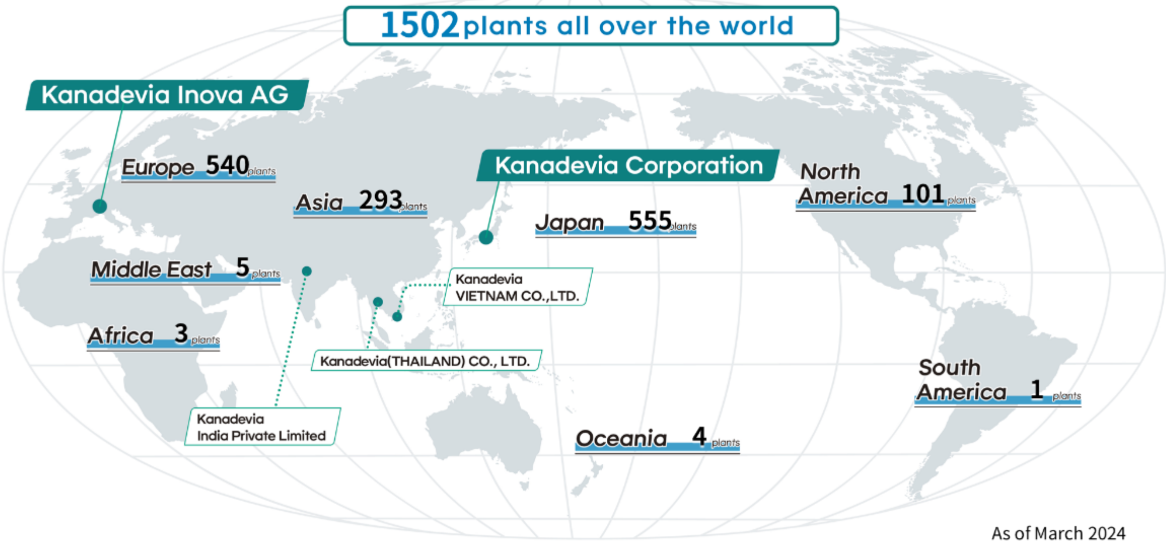

Figure 2-1 : Our WtE Facilities around the world

This report covers the WtE Business and biomass power generation business from the business areas indicated in the medium-term management plan, taking into consideration business scale, impact on natural capital, and evaluability. Since biomass power generation is often discussed together with biogas power generation, it is the subject of this report (as defined in Section 1, these are collectively referred to as " WtE Business"). The process of our mainstay waste incineration power generation is explained in the Appendix 1.

Based on the requests for proposal (hereinafter referred to as "RFP") issued by local governments and private waste treatment companies, we will implement waste incineration power generation facilities, biogas power generation facilities, and biomass power generation facilities (hereinafter collectively referred to as "WtE Facilities"). The WtE Facilities will be designed and manufactured based on RFP, constructed in cooperation with construction companies, and delivered after on-site coordinates. Therefore, this report does not cover procurements relating to other facilities[5] related to the WtE Facilities that are not designed by us. As we do not undertake demolition work on the WtE Facilities[6], this report does not cover the disposal of the WtE Facilities. Additionally, the WtE Facilities are either operated directly by the Group (hereinafter referred to as "direct operation") or by a Special Purpose Company (SPC), a subsidiary established to operate the facility on behalf on the facility's owner) (hereinafter referred to as "SPC operation", and hereinafter Direct operation and SPC operation are collectively referred to as "Operations.") In either case, the value chain for each item is assumed to be upstream (procurement), design/manufacturing, construction/on-site coordination, and downstream (operation/management), and the main raw materials, their production sites, manufacturing sites, construction/installation/disposal sites, and operation sites are organized and estimated within the scope of available data. The collection of waste, to be used as raw material for waste incineration power generation, is not included in this scope as it is not a business of our Group.

Future reports will include more data on dependencies and impacts in Operations, as well as upstream and downstream in the value chain, and will improve availability, and will expand the scope of analysis and disclosure. Data on the water business and other businesses of the Group will be analyzed and disclosed from next fiscal year onwards.

Table2-1: Scope of disclosure (Number of cases)

		Kanadevia Japan*1				Kanadevia Inova*1	
Region		Japan			China/Asia	Outside Japan	
Type		Facility delivery	SPC operation	Direct operation	Facility delivery	Facility delivery	Direct operation
WtE Business	WtE	Available	34	N/A	Available	Available	N/A
	Biogas Power Generation	Available	1	N/A	Available	Available	2
Biomass Power Generation		N/A	N/A	1	N/A	N/A	N/A

*1 "Kanadevia Japan" includes facilities operated by Kanadevia Corporation and its SPCs, and "Kanadevia Inova" includes facilities operated by Kanadevia Inova AG and its SPCs.
*2 The colored cells are the subject of this disclosure.
*3 This report analyzed data from facilities that are in operation in fiscal year 2023.

[5] This refers to facilities that are installed alongside waste incineration power generation facilities, etc., such as a heated swimming pool.
[6] Depending on the project, the Group may form a joint venture with a major construction company to carry out the demolition work ; however, this is outside the scope of this analysis and evaluation.

2.3 Areas with nature-related issues

This report addresses the procurement, design/manufacturing, construction/on-site coordination, disposal during construction, and "operation and management" (O&M) aspects related to the construction of the WtE Facilities as outlined in Section 2.2. It assesses the environmental impacts of business activities in each phase on nearby protected areas and areas of biodiversity significance, utilizing data from each facility. In addition, the impacts on the upstream value chain (facility materials, fuel) are assessed based on available data and estimated information. Where information is insufficient, a conservative assessment will be adopted. Within the scope of this report, nature-related issues have found to result from hazardous substances in emissions from local facilities established by the Group. Further details are provided in Sections 4.1 and 4.2.

2.4 Integration with other sustainability-related disclosures

Based on the Task Force on Climate-related Financial Disclosures (TCFD), the Group discloses information regarding its climate change initiatives, governance, strategy, risk and opportunity management, metrics and targets[7]. We will closely monitor future trends in the development of disclosure standards and promote the integration of TCFD and TNFD and the enhancement of information disclosure.

2.5 Period to be considered

Kanadevia has set *Sustainable Vision* for what the Group aims to be in 2050, and has set forth the Goals of "*Realize net-zero environmental impacts within Planetary boundaries*'' and "*Maximize people's well-being*.'' The 2030 vision and the medium-term management plan (Forward 25)[8] of the Group are , has been formulated using a backcast approach based on *Sustainable Vision*. Therefore, the period covered by this report is from now until 2050.

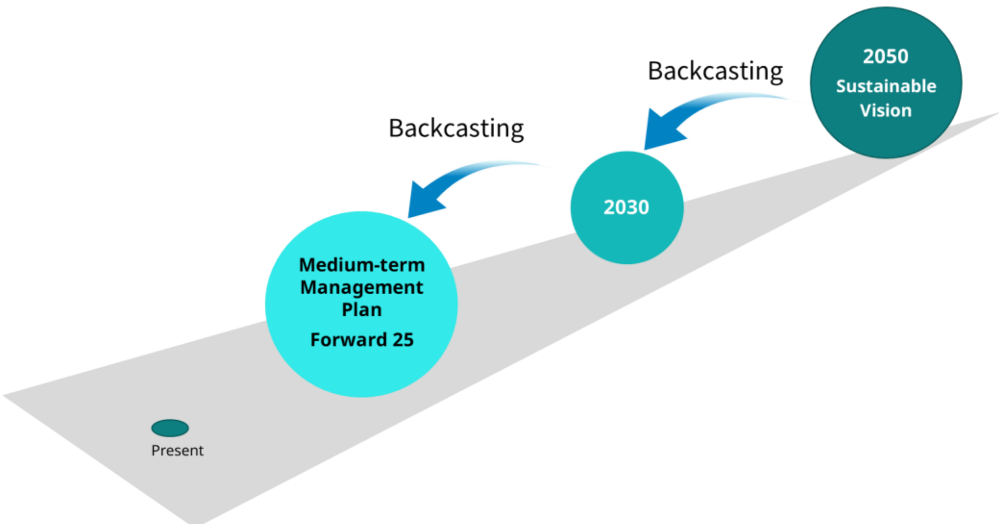

Figure 2-2 : Overall long-term vision

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[7] Disclosure based on TCFD: https://www.kanadevia.com/english/ir/data/pdf/ir2023_E_A3.pdf
[8] https://www.kanadevia.com/english/ir/policy/pdf/Hitachi%20Zosen%20Forward%2025.English_0323_0531.pdf

2.6 Engagement respect to Indigenous Peoples, Local Communities and Affected Stakeholders

It is not sufficient to merely engage in activities to solve environmental issues in order to achieve sustainable development. To achieve sustainable development, it is essential to recognize that people's basic needs, including health, influence, competence, impartiality, and meaning, must also be addressed. In conducting business, it is necessary for us to respect human rights not only within the Group but also throughout our supply chain. In accordance with the International Bill of Human Rights, the International Labor Organization's (ILO) Declaration on Fundamental Principles and Rights at Work, and the United Nations' Guiding Principles on Business and Human Rights, the Group established the human rights policy[9] in April 2024 and has set the goal of "thorough human rights due diligence and zero human rights risks[10]" as it promotes efforts to respect human rights.

In order to ensure that our initiatives to respect human rights are successful, it is essential that we gain the understanding and cooperation of not only the Group, but also the suppliers that make up our supply chain. In light of these considerations, the Group has established the Basic Procurement Policy[11] and are conducting sustainability surveys using the UN Global Compact SAQ (Self-Assessment Questionnaire)[12] to check whether our supply chain complies with this policy. This process involves a repeated cycle of (i) surveys, (ii) evaluation and feedback, (iii) requests for improvement, and (iv) reevaluation. The Group considers the human rights of local residents when procuring materials and constructing facilities, and strives to promote and improve efforts to reduce any actual and potential negative impacts on human rights to prevent human rights violations such as forced labor or child labor in our supply chain.

The plans and progress of sustainability initiatives, including respect for human rights, are reviewed and managed by the Sustainability Promotion Committee.

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[9] https://www.kanadevia.com/english/ir/policy/governance.html
[10] “Zero human rights risks” means minimizing human rights risks.
[11] https://www.kanadevia.com/english/supply/policy.html
[12] The UN Global Compact SAQ is the "CSR Procurement Self-Assessment Questionnaire" in the "CSR Procurement Self-Assessment Tool Set" created by the Supply Chain Subcommittee of the General Incorporated Association Global Compact Network Japan (GCNJ), a country network of the UN Global Compact. The questionnaire was created by extracting core items based on the 10 principles of the UN Global Compact, international guidelines such as ISO26000, and CSR questionnaires for specific industries, and is structured so that it can be shared between buyers and suppliers regardless of industry. Currently, it is used by the Group and some of our subsidiaries, but in the future it will be used by all group companies.

3. Governance

3.1 Sustainability Promotion System

The Group's sustainability promotion system, including natural capital-related matters, is centered on the Board of Directors and the Sustainability Promotion Committee, which sets strategies and goals to realize *Sustainable Vision*, and implements strategies and measures for important issues related to natural capital for the Group. This system supervises the implementation status and gives instructions.

In formulating the medium-term management plan, the Board of Directors and the Sustainability Promotion Committee engage in discussions to evaluate strategies and goals for realizing *Sustainable Vision*. In doing so, they consider the "nature-related dependencies, impacts, risks, and opportunities" (hereinafter referred to as "Nature-related Risks"). The Sustainability Promotion Committee monitors the progress of initiatives related to natural capital and provides updates to the Board of Directors. The Board of Directors receives this report and oversees the implementation of measures for important issues and initiatives. The Board of Directors addressing natural capital agendas are held twice a year.

The Sustainability Promotion Committee is chaired by the president of Kanadevia Corporation, and its members include general managers, business site heads, group company presidents. The Sustainability Promotion Committee confirms and discusses important issues and initiatives related to sustainability promotion across the Group. Additionally, it is responsible for overseeing risks and opportunities as well as their impacts on society and the environment, as well as approving matters to be reported. The Sustainability Promotion Committee meets 4 times a year.

The Sustainability Promotion Department, which serves as the secretariat for the Sustainability Promotion Committee, is responsible for the promotion of sustainable management, as well as formulating sustainability policies, implementing and supporting various Group-wide measures, and disseminating information. The Sustainability Promotion Department provides management with performance and progress updates on "locations" that should be prioritized from the perspective of Nature-related Risks. It has established a system for management to recognize and address issues in a timely manner.

The president of Kanadevia Corporation has the highest level of executive responsibility and accountability for policies, commitments, goal setting, evaluation, and management regarding Nature-related Risks.

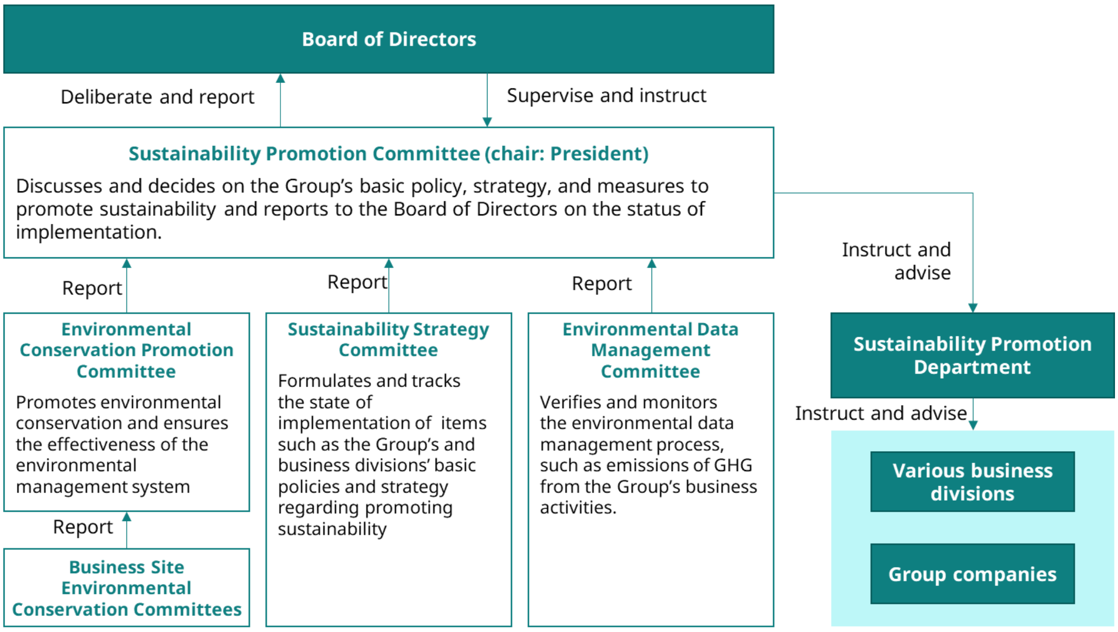


Figure 3-1 : Sustainability promotion system

3.2 Engagements respect to stakeholders affected by the Group's natural capital risks

The Board of Directors is responsible for oversight of engagement with indigenous peoples, local communities and affected stakeholders, and for approving reporting matters in this regard through the Sustainability Promotion Committee.

As described in Section 2.2, the WtE Business comprises two models: Direct operation and SPC operation. In either case, taking a proactive approach to environmental issues is crucial for building trust and symbiotic relationship between companies and society. This is an essential aspect of corporate social responsibility. In addition to continually improving our environmental management system and responding appropriately to environmental risks, we will actively promote the use of renewable energy, energy conservation, resource conservation, and actively engage in environmental conservation activities in the course of our business activities. As a result, the environmental impacts from our business will be less than the environmental resilience of natural capital, including biodiversity, leading to the realizing of sustainable local communities.

In the Direct operations, environmental pollution is identified as a risk item among Nature-related Risks. Specifically, there is a risk that problems such as the leakage of polluting substances and noise could have significant impacts on the natural and living environments of the local communities in which our business sites are located. In response to these risks, the Group is implementing the “Environmental Conservation Promotion Plan” at our offices and works, and construction sites. In the environmental conservation activities at each of our offices and works, we set voluntary standards that exceed legal requirements for the management of air, water, and soil pollutants, as well as noise, vibration, and odors. We also monitor and implement preventive conservation measures.

Similarly, environmental pollution-related issues are risk items in the context of SPC operations. In particular, these include issues such as the leakage of polluting substances and noise. There are risks that the WtE Facilities we are responsible for operating may have significant impacts on the natural and living environments of the local communities in which they are situated. To mitigate these risks, we thoroughly operate facilities in compliance with the rigorous environmental standards set by the facility owners, and conduct daily monitoring and preventive maintenance. Furthermore, we promptly inform the facility owners and support them in communicating with local residents and disclosing information.

It is crucial for the success of *Sustainable Vision,* which is to "*Realize net-zero environmental impacts within Planetary boundaries,*"[13] that our suppliers work with us in understanding and cooperation. In accordance with Section 2.6, the Group has established the Basic Procurement Policy and is conducting sustainability surveys using the UN Global Compact SAQ to confirm complies with this policy within the supply chain. The Group has set a an objective of sustainable procurement for all suppliers to achieve a sustainability promotion score of 80 out of 100 (UN Global Compact SAQ score: 100 out of 100) by 2050. In addition to safety, quality, delivery time, and price, we also evaluate suppliers on a number of other criteria, including fair and equitable trading, human rights, environmental conservation, corporate ethics, and the prevention of leaks of personal and confidential information. We seek to employ suppliers who are continually improving.

[13] Net-zero environmental impacts is defined as keeping the environmental impacts resulting from our own business activities, as well as the environmental impacts of the Group's supply chain and the environmental impacts of customers who use the Group's products and services, within the limits of the inherent environmental resilience of the country/region. See Section 6.2.1 for the goal and targets toward net-zero environmental impacts within Planetary boundaries.

4. Strategy

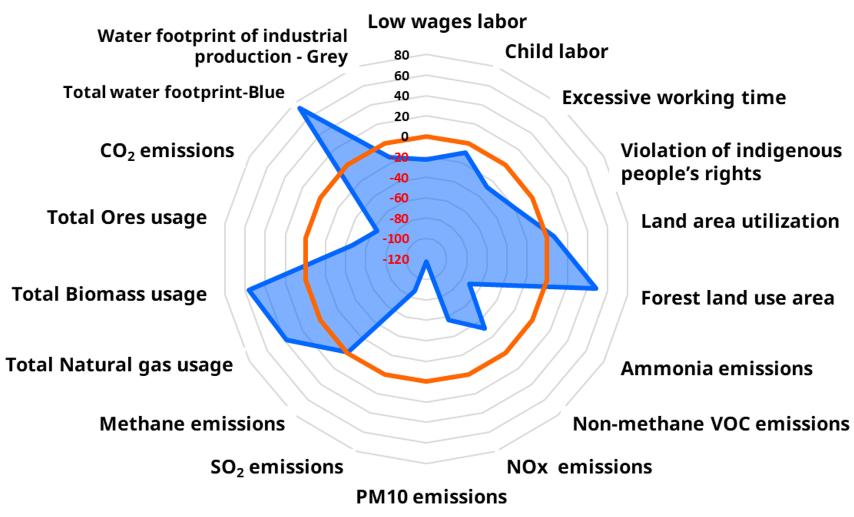
4.1 Dependencies and impacts on natural capital

4.1.1 Overview of the Dependencies and Impacts Assessment in this Section

In TNFD, the important impacts on the company are identified and narrowed down in relation to various natural capital. In this section, we analyzed the dependencies and impacts on natural capital of the WtE Business (the process of identifying and assessing Nature-related Risks is explained in Section 5.1). We use ENCORE[14], which is recommended by TNFD, when assessing the dependencies and impacts on nature of the Group's operating sites and our business partners' raw material procurement sites related to the target business (the procedure for assessing using ENCORE is explained in Section 4.1.3). In addition, in order to trace back the procurement sources and grasp the trend of the total environmental burdens on natural capital in the upstream of the supply chain, we made estimates using secondary data (macro statistics) such as the International Input-Output Table[15]. This estimation was made using the methodology of aiESG Inc. (hereinafter referred to as "aiESG"[16]), a member of TNFD Forum, and the results are summarized in Appendix 2.

4.1.2 Trends in total environmental burdens

In order to grasp the trend in the total environmental burdens, we used aiESG's method to analyze the characteristics of the total environmental burdens of procured goods and services in the WtE Business compared with other industries (Figure 4-1).



How to read the chart :

(Blue) Environmental burdens of the WtE Business
(Orange) Average environmental burdens of all industries in the G7

The larger the blue area, the more positive it is, i.e., the lower the environmental burdens. For definitions of each indicator, see Appendix 4.

Figure 4-1 : Average environmental burdens of G7 industries and environmental burdens of the WtE Business

[14] An abbreviation for Exploring Natural Capital Opportunities, Risks and Exposure. An assessment tool developed by financial institutions jointly by UNEP-WCSC and others, led by the Natural Capital Finance Alliance, to enable them to assess the extent of company's impacts on and dependencies on nature.
[15] International Input-Output Table: https://www.meti.go.jp/statistics/tyo/kokusio/index.html
[16] "aiESG" has established the ESG evaluation methodology that uses a variety of statistical data to estimate the supply chain all the way back to the end. https://aiesg.co.jp/

Figure 4-1 compares the total environmental burdens of the target business's procured goods and services (blue) with the environmental burdens assuming that all G7 industries procure the same amount (orange). The figure illustrates the extent to which the target business (blue) has reduced its environmental burdens in comparison to the benchmark (orange), expressed as a percentage. The larger the blue area, the greater the reduction in environmental burdens, which can be understood as a reduction in the burden themselves. This demonstrates that the WtE Business has a relatively high environmental burdens in terms of CO_2 emissions, ores usage, and pollutant emissions when compared to the average for all G7 industries. Furthermore, it is evident that items pertaining to the working environment, such as child labor and excessive labor, have a relatively significant burdens compared to the average for all G7 industries.

4.1.3 How to proceed with evaluation using ENCORE

For the WtE Business with the characteristics described in Section 4.1.2, we evaluated the impacts of corporate activities on the ecosystem in accordance with the guidelines provided by the LEAP approach[17] of TNFD v1.0, which has already been published, and ENCORE value recommended for use by TNFD framework. At that time, since ENCORE does not have a classification for waste incineration power generation, we adopted the "thermal power generation" item as a standard in view of the similarity as a power generation business, and we also used the operating data and environmental information of the waste incineration power generation facilities owned by the Group. Comparisons were made with relevant data to assess impacts on natural capital and dependencies on ecosystem services.

As shown in Section 2.2, the stages of the value chain are procurement, design/manufacturing, construction/on-site coordination, disposal during construction, and O&M, and are organized within the range of available data. We carried out an estimation.

The evaluation is conducted in five stages (Very High, High, Medium, Low, Very Low), in accordance with ENCORE. It considers the location and equipment of the facilities, agreements with laws and regulations and local governments, and whether the facilities are operating in accordance with their own standards. In each table shown in this report, we have selected and listed the natural capital ecosystem services with which we are involved, and omitted other items.

4.1.4 Assessment results of natural capital-related dependencies and impacts in the WtE Business

This report explains the evaluation results, highlighting their distinctive features and differences from ENCORE assessments.

[17] The TNFD has developed a process for systematically assessing nature-related risks and opportunities . The process comprises of four phases:
(1) Locating connections with nature,
(2) Evaluating dependencies and impacts,
(3) Assessing risks and opportunities,
(4) Preparing to address nature-related risks and opportunities and reporting to investors.

4.1.4.1 "WtE Business" / Dependencies Heatmap

Table 4-1 : Dependencies of the WtE Business on natural capital for

Process	Classification	Provisioning Services		Regulating Services								Maintenance Services	
		Surface water	Ground water	Contaminant neutralization	Climate regulation	Dilution by atmosphere and ecosystems	Filtration	Flood and storm protection	Mass stabilisation and erosion control	Mediation of sensory impacts	Ventilation	Water flow maintenance	Water quality
Procurement	Machine, parts and equipment manufacturing	H	H	-	VL	-	-	-	M	-	-	H	-
	Iron manufacturing	M	M	-	VL	-	-	-	L	-	-	M	-
Design and Manufacturing	Machine, parts and equipment manufacturing	M	M	-	VL	L	VL	M	VL	M	L	M	L
Construction and on-site coordination	Infrastructure Construction	-	-	-	H	-	-	M	M	-	-	-	-
Disposal during Construction	Infrastructure Construction	-	-	-	-	-	-	-	M	-	-	-	-
O&M	Waste incineration power generation	L	L	VL	VL	-	L	M	L	-	-	L	L

* The scale rating is abbreviated as follows in each table in Section 4.1.4.
Very High : VH, High : H, Medium : M, Low : L, Very Low : VL

- **Features**

In the "Procurement" process, water is important in the "Machine, parts, and equipment manufacturing" of the suppliers, which is why they depend on "Surface water" and "Groundwater" in the Provisioning Services and "Water flow maintenance" in the Maintenance services, each of which is "High." On the other hand, in the "construction and on-site coordination," "disposal during construction," and "O&M" processes, where the Group is actively involved, there is “Low” dependencies because consideration is given to the location and water circulation.

- **Changes in ENCORE assessments**

In Regard to the "Ventilation" aspect of the "design and manufacturing" process, ENCORE has assessed it "Very Low." However, given that Innoshima Work uses the sea breeze (natural ventilation) for cooling purposes, an assessment rating has been raised to "Low."

The following changes have been made to the use of " Mass stabilisation and erosion control ", "Water flow maintenance", "Surface water", and "Groundwater" in the "O&M" process.

The ENCORE rating for “Mass stabilisation and erosion control” is “Medium”. However, in view of the following points, the level has been lowered to “Low” as the project is assessed as less dependent on natural capital for “Mass stabilisation and erosion control”, regardless of whether the project is domestic or overseas.

(1) When selecting a site for a waste incineration and power generation facility, the client (e.g. municipality) should choose a location that is less susceptible to flooding and storms and less prone to erosion. Furthermore, the client should obtain a construction permit or design a structure that can withstand such conditions.

(2) The client shall set more stringent regulatory limits and operate and manage the facility in accordance with the findings of the environmental assessment conducted to obtain a construction permit.

Additionally, ENCORE's initial assessment of "Water flow maintenance," "Surface water," and "Groundwater" has classified as "Medium," but this has been downgraded to "Low" in this report. The clients select a location with low risks in the RFP, which is based on the environmental assessment, and the water used in the "O&M" process will be recycled, which has resulted in the project being assessed as having low dependencies on natural capital.

4.1.4.2 "WtE Business" / Impacts Heatmap

Table 4-2 : Impacts of the WtE Business on natural capital

Process	Classification	Land, freshwater and ocean use change			Direct use	Climate Change	Pollution/ Pollution removal				Others
		Terrestrial ecosystem use	Freshwater ecosystem use	Marin ecosystem use	Water use	GHG emissions	Non-GHG air pollutants	Water pollutants	Soil pollutants	Solid waste	Disturbances (noise /light)
Procurement	Machine, parts and equipment manufacturing	-	-	-	H	H	M	H	H	H	M
	Iron manufacturing	-	-	-	H	H	-	-	-	H	-
Design and Manufacturing	Machine, parts and equipment manufacturing	-	-	-	M	H	M	H	H	H	M
Construction and on-site coordination	Infrastructure Construction	VH	H	VH	H	H	M	M	H	M	H
Disposal during Construction	Infrastructure Construction	VH	H	VH	H	H	H	M	H	M	H
O&M	Waste incineration power generation	-	H	-	L	M	L	M	M	H	H

- **Features**

It should be noted that the risks are generally high at every stage of the process. In particular, the "construction and on-site coordination" and "disposal during construction" stages of the plant have been assessed "Very High" due to the potential for use changes of terrestrial or marine ecosystems, which could impact natural capital and ecosystems.

- **Changes in ENCORE assessments**

For the "O&M" process , there are the following changes for " GHG emissions", "Non-GHG air pollutants", and "Water use".

Regarding "GHG emissions," ENCORE, which assumes general thermal power generation, has assessed that the level is "High." However, for the following reasons, the level has been lowered to "Medium." In the WtE, GHG is emitted from the combustion of "plastics contained in the waste." Paper, wood and food waste are considered to be carbon-neutral fuels. Therefore, the amount of plastic contained in actual garbage will determine the degree of impact from GHG emissions. For example, according to the 2024 summary of the Japan Plastics Recycling Association[18], 14.9% of general waste is plastic. If this proportion is applied to other municipal waste levels, the greenhouse gas emissions impact is considered to be about 20% of thermal power plants. In addition, the total GHG emissions are several orders of magnitude smaller than the total emissions of electric power companies, including those published, so the level of impact has been changed from "High," which is the impact degree

[18] Plastic Waste Management Institute (Japan). "Basic knowledge of plastic recycling 2024" pp.3. https://www.pwmi.or.jp/pdf/panf1.pdf. (accessed 2024-8-10)

of a general thermal power plant, to "Medium."

ENCORE assessment of "Non-GHG air pollutants" is “High,'' but for the following reasons, the level has been lowered to “Low.'' The clients conduct an environmental assessment and establish regulatory values for operation management, and if these values are complied with, the environmental impact is low. The system also provides an emergency stop in the event of a disaster during operation. In other words, if an abnormality is detected by monitoring or analysis, the system can be shut down by activating the emergency stop button. After the facility is shut down, no more gas is generated because the waste is not burned, and any gas remaining in the facility is discharged in a purified state after passing through a bag filter. In addition, for substances harmful to humans (living organisms), we have set our own strict standard values that are approximately 1 in 10 or less of the regulatory values set by law, and have established a management manual to ensure thorough management. The values are monitored or obtained through regular sampling and analysis, and if the standard values are exceeded, the cause is considered and measures to reduce the amount (dilution, addition of chemicals, reduction of raw material input) are implemented, so that when discharged outside the facility, it is discharged below the regulated value, and if it cannot be reduced, the equipment is shut down. Therefore, the environmental impact is expected to be low, and the level has been lowered to "Low."

Regarding "Water use," environmental assessments have been carried out by clients at all facilities both in Japan and overseas, and it has been determined that there is sufficient water required for the Facilities. If there is a shortage of water, the business itself will be halted. As such, it has been assessed as having no impact and the level has been lowered to "Low."

4.1.4.3 "Biogas power generation (including fuel conversion and hydrogen utilization) "

Biogas power generation (including fuel conversion and hydrogen utilization) is being promoted mainly by Kanadevia Inova , and information is currently being collected.

4.1.4.4 "Biomass power generation" / Dependencies Heatmap

The only biomass power plant covered in this analysis is Miyanosato Biomass Power Plant.

Table 4-3 : Dependencies of the Biomass power generation on natural capital

process	Classification	Provisioning Services			Regulating Services								Maintenance Services	
		Surface water	Ground water	Material (wood chips)	Contaminant neutralization	Climate regulation	Dilution by atmosphere and ecosystems	Filtration	Flood and storm protection	Mass stabilisation and Erosion control	Mediation of sensory impacts	Ventilation	Water flow maintenance	Water quality
Procurement	Machine, parts and equipment manufacturing	M	M	-	-	VL	L	VL	M	VL	M	VL	M	L
	Iron manufacturing	M	M	-	-	VL	-	-	-	L	-	-	M	-
	Forest product production	M	H	M	-	-	-	-	L	L	-	-	L	-
Design and Manufacturing	Machine, parts and equipment manufacturing	M	M	-	-	VL	L	VL	M	VL	M	VL	M	L
Construction and on-site coordination	Infrastructure Construction	-	-	-	-	-	-	-	-	M	-	-	-	-
Disposal during Construction	Infrastructure Construction	-	-	-	-	-	-	-	-	M	-	-	-	-
O&M	Biomass Power Generation	L	L	-	VL	VL	-	VL	L	L	-	-	M	L

- **Features**

According to ENCORE, the risk of “Material (wood chips)” with regard to the “Procurement” process “Forest product production” is classified as “Very High”, due to the reliance of biomass power plants rely on this material. This is due to the reliance on raw material chips manufactured from logs (so-called unused wood) that have been systematically harvested in accordance with a forest harvesting plan for use as biomass fuel.

Miyanosato Biomass Power Plant purchases approximately 63,000 tonnes (equivalent to a moisture content of 40%) of wood chips per year from the adjacent chip factory (Miyanosato Biomass Limited Liability Partnership). The chip factory procures logs from approximately 27 organizations relevant to forestry, mainly in Ibaraki Prefecture, Japan. In addition to thinning materials, "unused materials" that can be used for biomass power generation are limited to logs that meet the following two requirements:

(1) They are felled based on the forest plan stipulated in the Forest Law (Japan), and

(2) Reforestation continues even after felling, and the area remains a forest.

Miyanosato Biomass Limited Liability Partnership, which supplies wood chips to Miyanosato Biomass Power Plant, is certified by the Japan Wood Chip Industry Association as a "certified business operator for the certification of wood biomass for power generation use," and uses only wood chips made from thinned wood from the forests. Therefore, the “Material (wood chips)” dependency level has been lowered to “Medium.”

- **Changes in ENCORE assessments**

In addition to the “Material (wood chips)” referred in the aforementioned features, the “Procurement” process for “Forest Product Production” entails the following changes with respect to “Surface water” and “Water flow maintenance.”

With regard to the "Surface water,” the level has been assessed to "Medium" as surface water from rivers is not directly utilized in the cultivation of raw wood, which is grown using rainwater.

With regard to the “Water flow maintenance,” the level has been lowered to "Low" due to the fact that the chip factory does not utilize water except for domestic purposes, and there have been no instances of water flow or other factors affecting the cultivation of logs .

With regard to the "O&M", the following amendments have been made to "Surface water", "Groundwater", and " Mass stabilisation and erosion control ".

The level for “Surface water,” the level has been lowered to "Low" due to its management under water rights, the plant’s modest scale, and the limited impact on the local area. With regard to the "Groundwater," the level has been adjusted to "Low" due to the fact that industrial water or drinking water is utilized and there is no direct usage of "Groundwater."

In regard to " Mass stabilisation and erosion control," Miyanosato Biomass Power Plant is designed for outdoor use and is situated in an industrial park on high ground, which makes it less vulnerable to the effects of typhoons and other weather conditions. Fuel chips are stored either indoors or outdoors, but even in the case of outdoor storage, the retention period is short and they are less susceptible to the effects of rainfall. Therefore, the level has been lowered to " Low."

4.1.4.5 "Biomass power generation"/Impacts Heatmap

Table 4-4 : Impacts of the Biomass power generation on natural capital

Process	Classification	Land, freshwater and ocean use change	Direct use	Climate Change	Pollution/ Pollution removal				Others
		Terrestrial ecosystem use	Water use	GHG emissions	Non-GHG air pollutants	Water pollutants	Soil pollutants	Solid waste	Disturbances (noise /light)
Procurement	Machine, parts and equipment manufacturing	-	H	H	M	H	H	H	M
	Iron manufacturing	-	H	H	-	-	-	H	-
	Forest product production	M	-	H	-	H	H	-	-
Design and Manufacturing	Machine, parts and equipment manufacturing	-	M	H	M	H	H	H	M
Construction and on-site coordination	Infrastructure Construction	VH	H	H	H	M	H	M	H
Disposal during Construction	Infrastructure Construction	VH	H	H	H	M	H	M	H
O&M	Biomass Power Generation	-	L	M	H	M	-	H	-

- **Features**

In the case of biomass power generation, as in the case of the WtE Business, the risk of “land use change” on “terrestrial ecosystem use” during the process of “Construction and on-site coordination” and “Disposal during construction” of the plant is classified as “Very High”. In addition, the overall impacts on natural capital are high. However, the Miyanosato Biomass Power Plant is located inland, so there is no impact of “land use change” of “marine ecosystem use.” Furthermore there are no rivers or other bodies of water nearby, so there is no impact of “land use change” of “freshwater ecosystem use.”

- **Changes in ENCORE assessments**

For the “O&M” process, the risk levels for “GHG emissions”, “Non-GHG air pollutants” and “Water pollution” have been downgraded for the same reasons as for the WtE Business. In addition, as mentioned in the Features, only for the “Miyanosato Biomass Power Plant,” the impacts of “land and freshwater use change” of “marine ecosystem use” and “freshwater ecosystem use” are considered to be negligible, and have therefore been removed from the assessment.

4.2 Disclosure of Location

4.2.1 Estimation of environmental impacts in procurement using the International Input-Output Tables

The qualitative analysis using ENCORE, as detailed in Section 4.1, indicated that the “procurement” process generally has significant impacts in the value chain of both WtE and biomass power generation. In order to reduce the environmental impacts of procurement, it is necessary to trace the procurement route back. However, in the WtE Business, most of the equipment used in the facilities are not manufactured in-house, but rather the products and parts procured based on the customer's RFPs are assembled, installed, and coordinated on-site. In procurement, except for "steel," which is a material that can be commonly used in any plant, equipment such as "cranes" and "boilers" that are appropriate for each project according to customer’s requirements are ordered, so there is no fixed supplier. Therefore, in order to grasp the environmental impacts of the supply chain macroscopically, the environmental impacts and the location of the risks destination (by country) have been estimated using the FY2023 procurement data and the International Input-Output Tables for the business entities included in this report. The estimation was made using the database of aiESG.

The assessment indicated that the burden of ores usage in the supply chain was concentrated in resource-rich countries, with a significant burden attributed to copper mining in Chile and the mining industry in China, Russia, and Poland. In terms of CO_2 emissions, the burden was concentrated in regions such as Poland, China, Germany, and Japan, where the factories that supply the equipment to be installed in the plants are located. A review of the data by industry revealed that the construction industry (Poland, Germany, etc.) and the electronic and steam-related parts industry (Poland, China, Japan, etc.) were the primary sources of emissions. In terms of water footprint of industrial water (Grey), the largest burdens are found in Poland, the United States, Germany, China, Italy, and Japan. In terms of industry, the construction machinery industry and the construction industry are the most affected. The largest water footprint of industrial water (Grey) is in the machinery and equipment procurement process, followed by construction-related processes. Of these, Poland, the United States, Germany, and China are known to be areas with high water risks. Therefore, we plan to conduct an analysis based on more detailed location information. A detailed analysis is provided in Appendix 2.1.[19]

Based on this estimate, we will confirm the locations of our suppliers and further consider the impacts on nature.

[19] The world map in Appendix 2.1 uses orange to indicate suppliers of Kanadevia Japan and blue to indicate suppliers of Kanadevia Inova. These suppliers were identified through the International Input-Output Table. The size of the circle represents the size of the burden. Note that due to the nature of the tracing, which was conducted using the International Input-Output Tables and international statistics, there may be some discrepancies from the current situation. These discrepancies may be due to factors such as the resolution and the time and method of collecting the statistical data.

4.2.2 Assessment of the importance of biodiversity at each operation sites

For facilities directly or through SPCs within the scope of the report, we utilized a database of protected areas and Key Biodiversity Areas (KBAs)[20], which are crucial areas for biodiversity conservation, to assess the relationship between the business and nature. The assessment was conducted on a five-point scale (Very High, High, Medium, Low, Very Low), taking into account differences in location and business characteristics, applicable laws and regulations, agreements with the local communities, and whether operations were conducted in accordance with the Group standards.

As a result of evaluating facilities in Japan where "construction/on-site coordination," "O&M (in the case of SPC)," or "disposal during construction" are planned during the evaluation period, they are found to be rated as "Low" or "Very Low." In addition, it has been found that the location of one facility in Japan may have a negative impact on living organisms, including endangered species (VU/endangered IB), at KBA, which is located 2 km from the facility. Looking at incidents at this facility since it began operations to the present, there has been one cooling water leak. Water quality analysis of the cooling water that leaked into the river found that all values except for pH were within prescribed limits and the impact on the surrounding environment was low. Additionally, measures to prevent recurrence have been implemented. However, taking into account the location of the facility and the fact that an accident occurred, the risk associated with this facility has been determined to be "Very High."

Similar evaluations are made for overseas locations where Kanadevia Inova or its subsidiaries directly operate, but as of now, there have been no locations rated "Very High" or "High." Although we are expanding the WtE Business in Asia, the contract format is different from that in Japan, so we are currently considering how to respond, including how to collect information that will serve as the basis for evaluation.

[20] Key Biodiversity Areas (KBA) are areas designated by international NGOs as key areas that play a key role in he conservation of biodiversity. https://www.keybiodiversityareas.org/

4.3 Financial risk analysis related to natural capital

4.3.1 Subject of financial risk analysis

In light of the assessment results in Sections 4.1 and 4.2 and the business strategy policy outlined in the 2030 Vision, it became evident that GHG emissions, water use, and the environmental burdens associated with ores usage are the items with the highest degree of dependencies and impacts. After identifying specific risk elements (classified as either Physical risks or Transition risks) and evaluating the anticipated financial impacts of these risks, it was found that the risks associated with "water use" in the "design and manufacturing" and "solid waste" in the "O&M" are significant. The following section presents a financial risk[21] analysis targeting the environmental impacts associated with water use, solid waste emissions during operations, and ores usage.

Regarding GHG emissions, it is thought that significant quantities are emitted during steel manufacturing, power generation, and infrastructure construction, but as these are discussed in the TCFD report, they have been excluded from this report, with further details provided in Appendix 2.2.

4.3.2 Environmental impacts of Water use

4.3.2.1 Risks at the design and manufacturing stages

The risk of disrupting the balance of the surrounding ecosystem due to the direct water use is classified as "High" at the following stages of the process: procurement, design and manufacturing, construction and on-site coordination, and disposal during construction. Of these, it was found that the physical and transitional risks are significant for the design and manufacturing phases, which the Group is directly involved, as shown in the table below.

Table 4-5 : Physical risks and Transition risks in the WtE Business (design/manufacturing)

Process	Risk Classification	Risk Type	Risk Overview
Design/ Manufacturing	Physical risks	Acute risks	Restrictions on production due to inability to secure the water required for production
		Chronic risks	Closing of manufacturing plants due to inability to consistently secure the water required for production
	Transition risks	Reputation risks	• Restrictions on operations due to government orders to restrict water withdrawals • Suspension of operations or withdrawal from business due to criticism from local residents and local governments regarding water use. Suspension of operations or additional investment for countermeasures

[21] The financial risks in the WtE Business, which is primarily engaged in plant engineering and facility operation contracts, can be categorized into: (i) risks such as compensation for damages in the event of an environmental accident at a facility, factory or business office directly operated by the Group; (ii) financial risks associated with price increases and delivery delays of equipment and parts; and (iii) risks associated with compensation for damages associated with non-performance of the operation contract.

Process	Risk Classification	Risk Type	Risk Overview
Design/ Manufacturing	Transition risks	Policy risks	Policies restricting water withdrawals have forced operations to be curtailed or suspended
		Market risks	There is a possibility of losing opportunities if we are unable to produce the expected amount
		Technology risks	- (Technology development is required to make it possible to produce with less water)

However, at this time, we have assessed the financial impacts of these risks to be small. The reasons are as follows:

(1) The vast majority of our equipment and materials are purchased from third parties, with only a small proportion of items manufactured in-house.
(2) The level of environmental management activities in the Group's manufacturing processes is high.
(3) In the future, we will be able to lower the assessment of our dependencies on and our impacts on natural capital by promoting the introduction of water recycling system and further promoting environmental management activities.
(4) The scale of direct water usage in the assembly and engineering of purchased equipment and materials is not very large, and no corresponding risks have been an issue in the past.

Therefore, we have assessed that the financial impacts of Physical risks and Transition risks in the design and manufacturing process to be small.

4.3.2.2 Risks at the procurement, construction, on-site coordination, and disposal during construction stages

Water used in the each stage of "machine, parts and equipment manufacturing", "infrastructure construction", and "disposal during construction" are each managed by suppliers, construction companies, and waste disposal companies, and are not under our direct control.

The Group has set "*Sustainable procurement*" as the *Pillar of Success*, and aim to reduce the environmental impacts throughout our value chain. When directly or indirectly entering into a contract with us, we ask for the understanding of the Basic Procurement Policy, and by promoting the reduction of environmental impacts throughout our value chain, we are able to reduce our dependencies on and impacts on natural capital.

Even if we are unable to gain understanding of the Basic Procurement Policy and we determine that there is a high possibility that these risks will materialize to third parties, we will be able to consider alternative measures, so we will assess that the impacts will be temporary. Therefore, even though we are not directly involved, it is our assessment that the financial risks associated with water usage at each stage of the procurement, construction, on-site coordination and disposal during construction are minimal.

4.3.2.3 Risks at O&M stage

This section outlines the impacts on individual customer projects. When operated by us, the water usage in the treatment process is recycled. At a facility with a waste treatment capacity of 330 tonnes per day that we have installed in Japan and are contracted to operate, the amount of water recycled for equipment cooling and boiler circulation is approximately 57 times the amount of water taken in, and a completely closed system has been established with zero discharge to the outside. At other facilities, water used in the treatment process is also recycled, so the impact of water usage in the operation of the WtE Facilities will be minimized.

However, there is room to assume that regulations related to the WtE Facilities in the proposed country/region will be strengthened, and that operations may have a negative impact on local residents. In this case, for the Group, the financial risks will be a maximum of 1 to 10 billion yen (JPY), assuming that the contractual upper limit for damages is roughly the order amount, and we think that the impact will be within this range in the short term.

4.3.3 Environmental impacts associated with solid waste discharge during operation

Whether it is a waste incineration power generation process or a biomass power generation process, bottom ash and air pollution control residue (APCR) are generated in the final step of the process, and both are disposed of in landfills. At this step, there is no incineration technology that does not generate bottom ash and APCR (however, there is technology to recycle waste from biogas power plants into compost) . Therefore, as the WtE Business are expanded to least developed countries in the future, it is thought that the risks associated with the discharge of these solid wastes will increase.

Table 4-6: Physical risks and Transition risks of the WtE Business (O&M)

Process	Risk Classification	Risk Type	Risk Overview
O&M	Physical risks	Acute risks	-
		Chronic risks	In cases where the final disposal of incineration residues is landfilling, operations will be suspended due to the depletion of landfill sites.
	Transition risks	Reputation risks	Criticism and lawsuits over solid waste such as incineration residues that have a negative impact on the ecosystem
		Policy risks	The amount of waste incineration will decrease due to stricter recycling systems, leading to (i) a decrease in power generation, (ii) the establishment of recycling standards for incineration residues, and (iii) increased costs in the event of violation of laws and regulations.
		Market risks	Increasing preference among local governments and citizens for less waste and a circular economy.
		Technology risks	-

4.3.4 Environmental impacts associated with Ores Usage

As shown in Section 4.2, the amount of ores usage in procurement is concentrated in resource-rich countries such as Chile, China, Russia, and Poland. The High Impact Risk Commodity List (HICL)[22] defined by Science Based Targets for Nature (SBTs for Nature)[23] may cause financial risks due to price hikes and delivery delays due to the deterioration of natural capital and strengthening of regulations.

Certainly, rising prices and delivery delays of HICL materials will increase project costs and delay project execution. However, in the short term, the impact will be on a project-by-project basis, and will be absorbed by the contract risk of each project. Therefore, if risks become apparent, we will bear contractual responsibility in accordance with the contractual provisions of each project. In this case, the financial risk will be a maximum of 1 to 10 billion yen (JPY), assuming that the contractual upper limit for damages is the order amount, and the impact will be within this range in the short term.

We have not yet analyzed the patterns of risk manifestation in the HICL material supply chain and the associated impact on medium- to long-term financial risks due to a lack of relevant information both domestically and internationally. We will consider conducting additional analysis in the future.

[22] High impact commodity lists (HICL) https://sciencebasedtargetsnetwork.org/wp-content/uploads/2023/05/SBTN-High-Impact-Commodity-List-v1.xlsx

[23] SBTs for Nature is a framework and technical guidance to encourage companies and cities to set science-based nature-related targets. It has been developed by the Science Based Target Network (SBTN) . https://sciencebasedtargetsnetwork.org/

4.4 Natural capital opportunity analysis

4.4.1 Opportunities in the WtE Business

The explosive growth in the world's population is causing problems such as energy, resource, food and water shortages, problems with housing, waste issues and the collapse of biodiversity. This is leading to growing demands for a shift to a society of "*Realizing net-zero environmental impacts within Planetary boundaries*"[24], and is expected to lead to an expansion of the market for environment-related businesses due to heightened environmental awareness and stricter regulations.

As a plant engineering company for the WtE Facilities, Kanadevia has been commissioned by clients based on the requirements of their WtE Facilities, and has carried out EPC work widely both domestically and overseas, with a world-class delivery record. Waste incineration power generation is a technology that generates electricity by burning waste, a special fuel. Kanadevia has the know-how and core technology related to the combustion of such special fuels, and our strengths include the technical capabilities to provide one-stop service including business development, design, construction, and AOM (after-sales service, operation and management, and maintenance), as well as the ability to make proposals backed by technology, such as proposals to combine technologies such as CO_2 capture and methanation with the WtE Facilities, and proposals for biogas (methane fermentation) facilities. Based on the optimal facility model derived from our extensive experience, we will go beyond the conventional WtE framework to promote resource recovery and recycling, and realize a virtuous cycle of expanding business areas with higher added value and reducing environmental impacts throughout the entire waste treatment value chain.

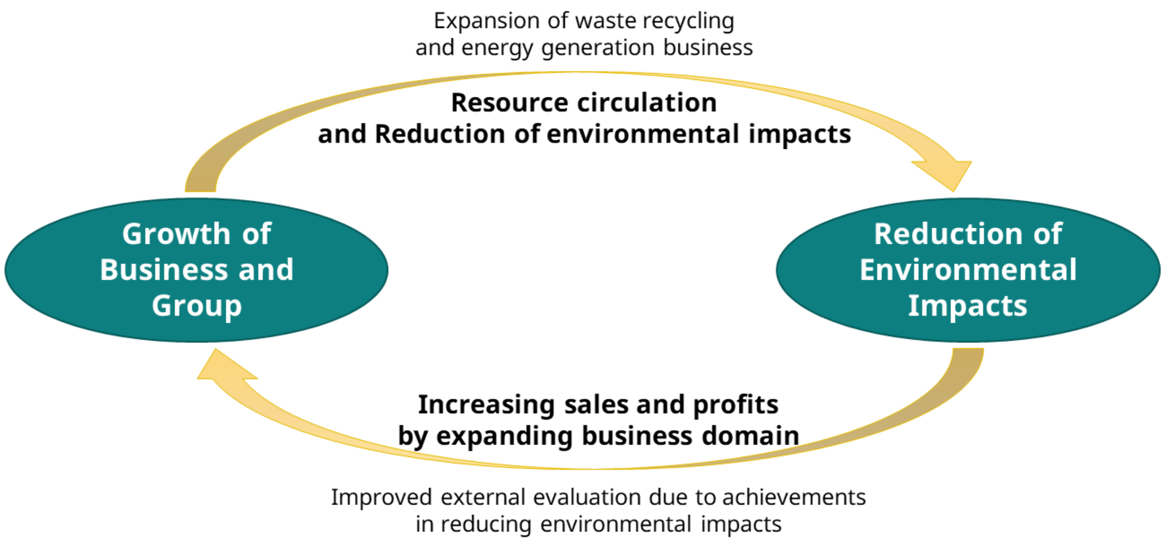


Figure 4-2 : Image of a virtuous cycle of business growth and reduced environmental impacts

[24] See note 13

4.4.2 Proposal of a locally rooted business model

The waste problem itself and the maturity of efforts to address it vary from country/region to country/region. However, the key to simultaneously achieving growth for the Group and reducing the environmental impacts is to work with local business players to develop a business model rooted in the region and expand our business. As an example, in relation to our *Pillar of Success* (Materialities), "*Maximize environmental recovery power*," we have initiated the closure of open dumping sites. However, our approach will not simply involve the introduction of incineration facilities in the area. Instead, we will propose comprehensive solutions that encompass a range of strategies, including the conservation of the ecosystem in areas scheduled for development, and the prevention of marine pollution due to waste leakage from open dumping sites.

Our technical and proposal capabilities allow us to find new opportunities in each element of the WtE Business value chain that is considered to be high risk. These opportunities can be realized by improving our engineering capabilities. As an example, at present, there is no incineration technology that does not generate bottom ash and air pollution control residue (hereinafter, referred to as “APCR”). However, we will work on developing technologies to reuse bottom ash and APCR, and consider this as an opportunity to promote the transition to circular economy. We will also consider proposals to minimize the emission of "waste," which is the source of bottom ash and APCR. (Details are shown in Table A-2 in Appendix 2.3.)

Kanadevia will promote efforts to reduce the burdens on natural capital throughout the value chain by consistently leading all processes, including sales and proposals, procurement, design and manufacturing, construction and on-site coordination, disposal during construction, and O&M (Figure 4-3). Details of our efforts are described in Table A-3 in Appendix 2.3.

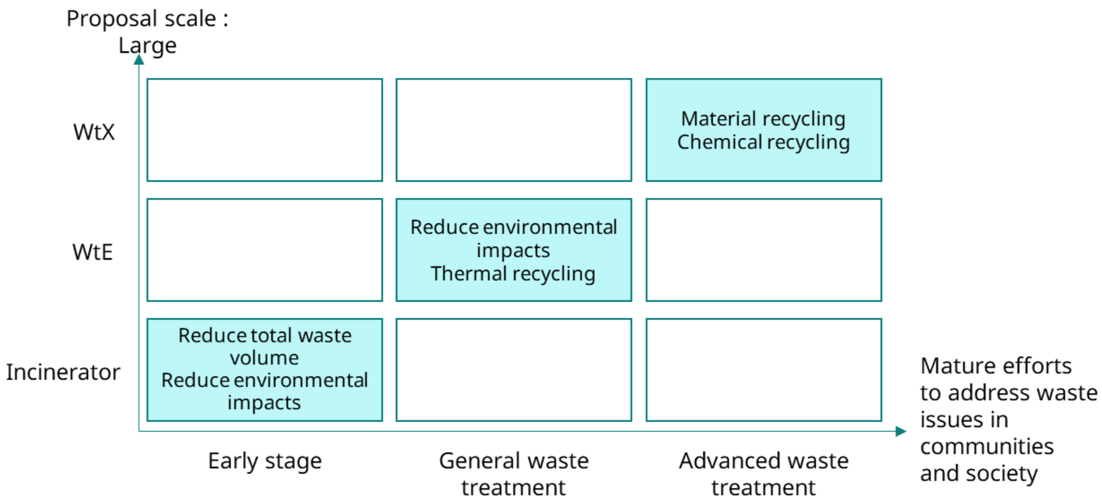


Figure 4-3 : Maturity of efforts to address waste issues and business patterns

4.4.3 Proposal for Standardization of waste treatment processes through uniformity of waste types and qualities

It is anticipated that the volume of waste generated globally will increase in Africa, Latin America and Asia, in the coming years, reaching an estimated 32 billion tonnes per year by 2050[25]. While the facilities and services required will vary depending on the maturity of the waste issue, the types and qualities of waste are likely to become more similar in the future due to the acceleration of globalization.

The standardization of waste quality and the use of digital technology should enable the waste treatment process to be standardized, rather than responding to the individual circumstances of each country/region. As standardization progresses, it is expected to function more effectively in product procurement and reuse, improve the quality of engineering, and, as a result, reduce accidents that cause environmental pollution.

[25] Yoshizawa Saeko et al. Research on Estimation and Future Prediction of Global Waste Generation. Proceedings of the 15th (Volume 1) 2004.11.17-19, pp.38-40. At the time of its publication, the world's waste generation was predicted to be about 27 billion tonnes in 2050. Later, co-author Tanaka Masaru predicted it to be about 32 billion tonnes (Tanaka Masaru. Estimation and Future Prediction of Global Waste Generation: About the 2020 Revised Edition: From the Special Feature of the 42nd National Urban Cleaning Research and Case Presentation Session. Urban Cleaning = Journal of Japan Waste Management Association. 74(361):2021.5,pp.277-286.) , and this report is based on the 2020 revised edition.

4.5 Strategy

4.5.1 Towards 2030: From WtE to WtX Business

The Physical risks in Kanadevia have the potential to impact our customers, as they represent major risks downstream in the supply chain where the WtE Facilities operate. As for Transition risks, the more environmental awareness increases, there will be a greater demand for the WtE Facilities from local communities seeking smaller environmental impacts. Consequently, there will be greater scope for engineering businesses to tackle more difficult challenges. This will inform the Group's strategy for 2050. As a plant engineering company, our goals are to reduce the environmental impacts and improve the environmental performance of the WtE Facilities. This will mitigate Physical risks and enable us to meet our customers' heightened environmental conservation requirements through our engineering capabilities. With regard to Transition risks, we will propose the introduction of the WtE Facilities, which have high environmental improvement effects, to customers facing difficult issues such as open dumping sites. The second strategy is to accelerate the business of formulating such projects. In order to achieve our vision, it is essential that we further refine our engineering expertise and propose more sophisticated solutions that address migration risks with greater speed.

In light of the growing importance of decarbonization, circulation, and the stable supply of raw materials and energy in countries around the world, we view waste as a valuable resource. For instance, we are striving to develop technologies that can create valuable resources from waste, including recyclable products, green electricity, biomethane, green ammonia, green hydrogen, and other chemicals that form the basis of various value chains, as well as recycled metals.

As a vertically integrated waste treatment plant engineering company, Kanadevia provides comprehensive support to our customers at every stage of the value chain, from business development to long-term service agreements. In order to proactively propose business models rooted in the local community, our fundamental strategy is to extend beyond the WtE, which converts waste into energy, and become the first in the world to commercialize a business that advances material and chemical recycling using waste as raw materials. This is what we refer to as "Waste to X (WtX)" Business. This will allow us to develop a range of business models in advance of our competitors and to make comprehensive proposals that align with the level of efforts being made to address waste issues in different countries/regions (Figure 4-4). In line with the medium-term management plan, "Forward 25," we are targeting a business size of 550 billion yen (JPY) by 2030 through expansion of the WtE Business and its evolved business, the WtX (Figure 4-5).

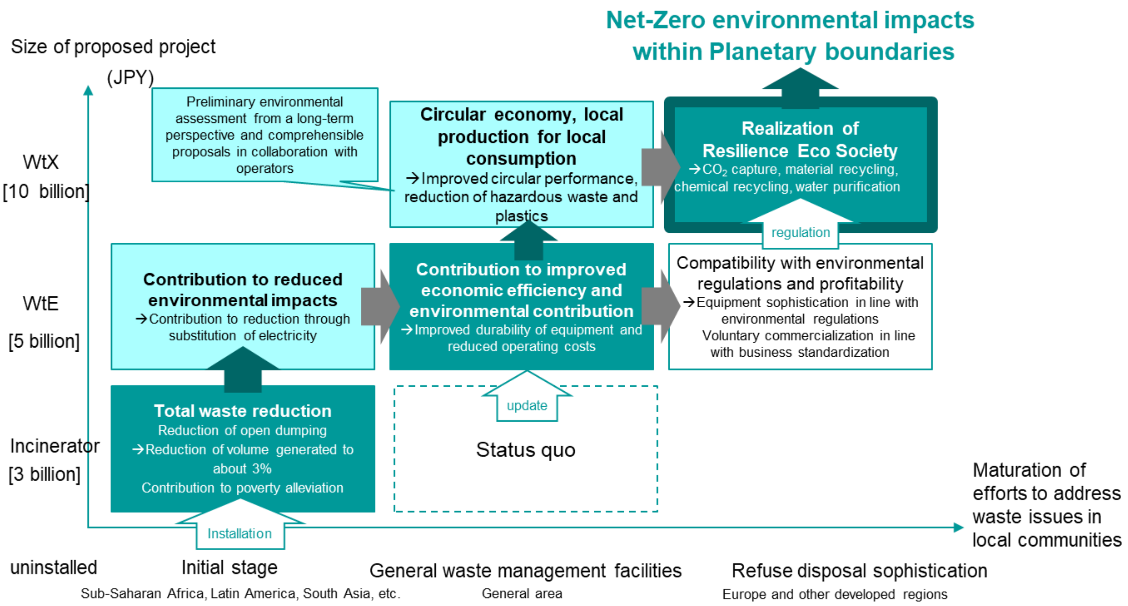


Figure 4-4: Business proposals according to the maturity of efforts to tackle waste issues

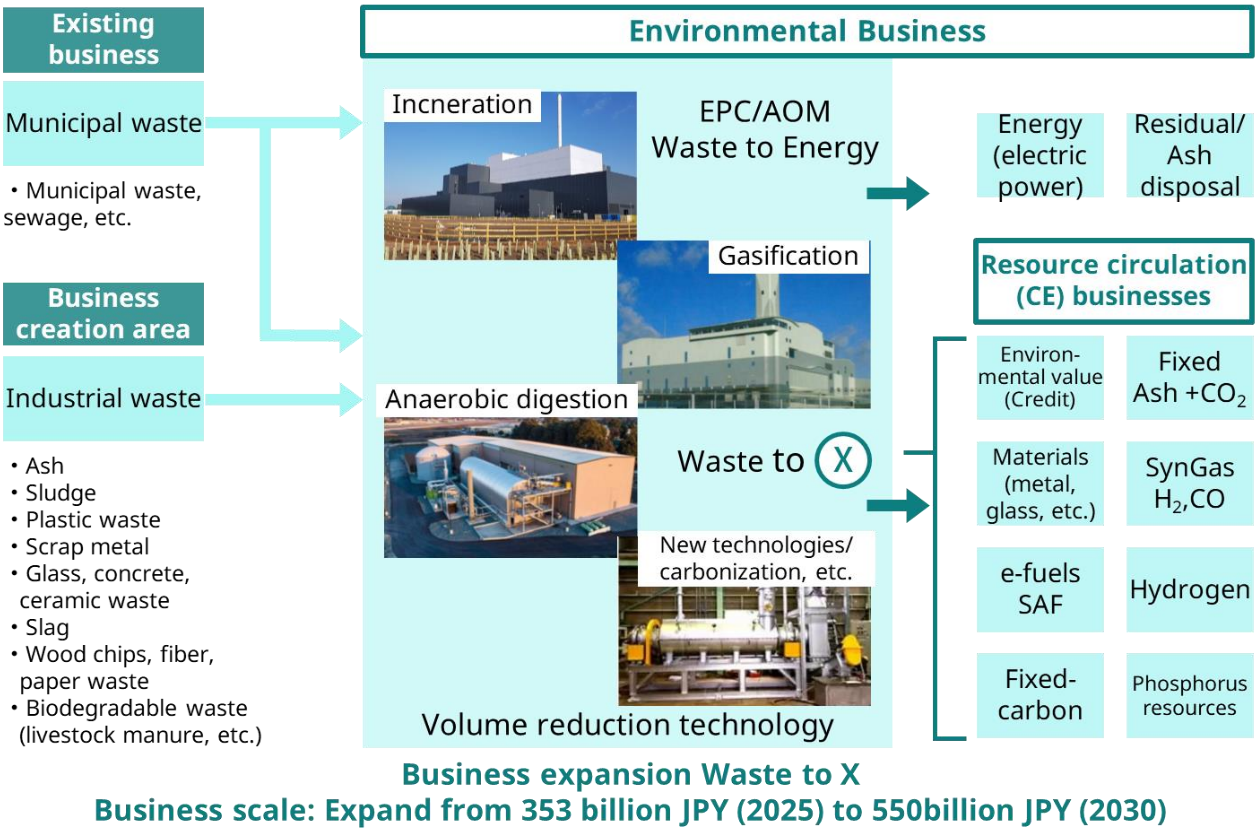
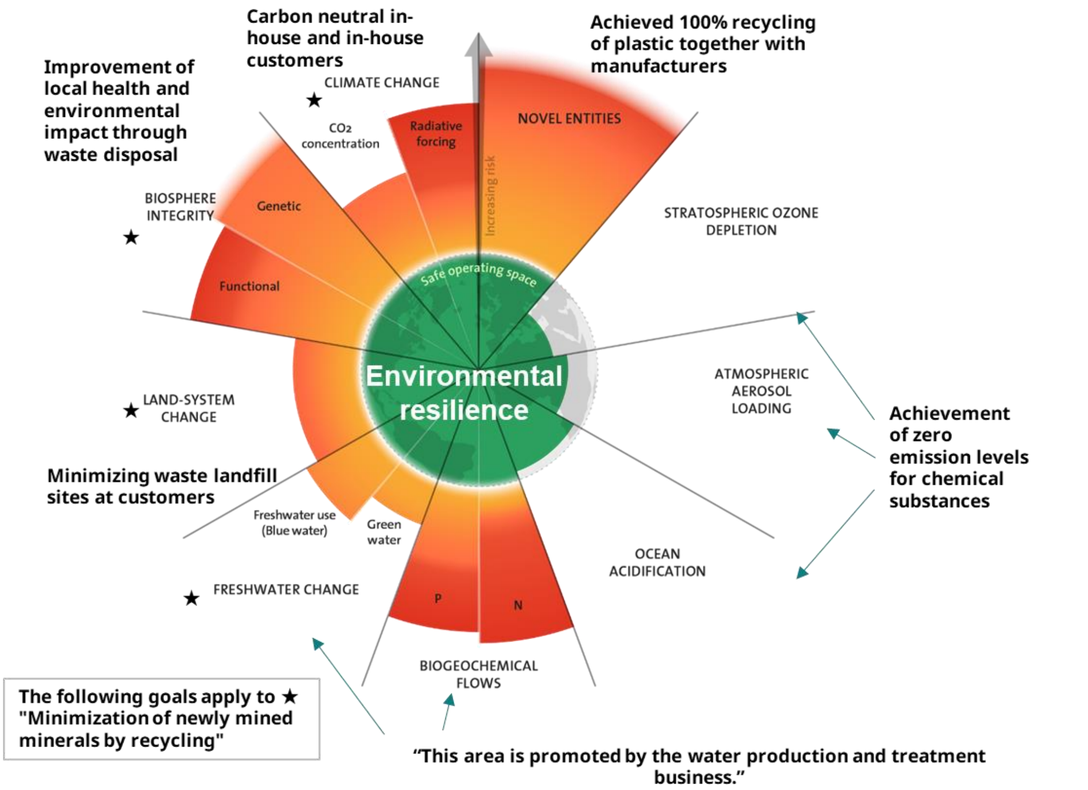


Figure 4-5 : Expansion to the WtX Business

4.5.2 Towards 2050: "*Resilience Eco Society*" concept that does not waste anything

Kanadevia proposes the "***Resilience Eco Society***" in which the environmental burden is below the environmental resilience capacity and "*net-zero environmental impacts within Planetary boundaries*[26]" is achieved by 2050. In the "***Resilience Eco Society***," we aim to achieve a state in which the environmental impacts in the region is contained within the environmental resilience of Planetary boundaries[27] by significantly reducing waste itself through "strengthening the environmental resilience of the region's natural capital" and "not wasting anything" (Figure 4-6).



Source: Stockholm Resilience Centre(2024) prepared by Kanadevia

<u>Figure 4-6 : Planetary boundaries and contribution of the WtE/WtX Business to mitigating the environmental impacts</u>

In the "***Resilience Eco Society***," certified products that are designed for easy separation are ubiquitous. Waste is no longer simply discarded; rather, it is recycled. A variety of chemical recycling technologies have been developed, and most waste is now transformed into new raw materials. Linking the distribution channels of waste and products allows for the expansion of waste collection areas, and thereby increasing productivity. When it becomes possible to predict waste generation as well as the sales destinations and prices of recycled materials based on big data in collaboration with upstream companies in the value chain, waste will be positioned at the top of the arterial industry as a resource, just like arteries and veins in the human body.

[26] See note 13.
[27] See note 1.

Waste that is not recycled through material or chemical recycling is subject to incineration. However, through the Integrated Recovery Facility[28] equipped with CCUS equipment, it can be used as energy without GHG emissions. Our goal is to provide a solution that is both cost-effective and easily adopted, not only in developed countries where waste treatment infrastructure is widespread, but also in major cities around the world, such as the Middle East and Africa, where landfilling is the norm.

To realize the "***Resilience Eco Society***," Kanadevia must transition from its current the WtE Business to a diversified energy supply and material and chemical recycling business by 2050. In other words, the current waste treatment process must evolve into one that extracts valuable resources for society through material recycling, chemical recycling, and carbon-neutral thermal recycling, while significantly reducing the environmental impacts. With the WtE Business at its core, Kanadevia will contribute to reducing the environmental impacts by utilizing technologies related to the WtE/WtX Business that we are already working on, such as renewable energy hydrogen, methanation, wind power generation, and all-solid-state batteries, and by collaborating with various companies.

Appendix 3 details how the Group minimizes its environmental impacts, while contributing to reducing the environmental impacts of others, within the environmental resilience of the countries and regions in which it operates.

[28] The Integrated Recovery Facility is a new model of waste incineration power generation proposed by ESWET (European Suppliers of Waste-to-Energy Technology, an association of European waste-to-energy companies). It produces hydrogen and synthetic fuels from waste and reduces CO_2 emissions by maximizing energy and heat recovery.

5. Risk and Impact Management

5.1 Nature-related Risks identification and assessment process

As Kanadevia is engaged in environmental business such as the WtE Facilities and water-related plants, the promotion of our business is linked to the improvement of the environmental impacts of the local community. Therefore, in order to realize each strategy for "Evolution to WtX Business" toward 2030 and "***Resilience Eco Society***" toward 2050, it is essential to integrate Nature-related Risk management processes and the risk management of the entire organization.

First, the process of identifying and assessing Nature-related Risks in the WtE Business in fiscal 2024 is based on the LEAP approach and makes reference to the already published TNFD V1.0 guidelines and tools. In terms of the qualitative assessment of Nature-related Risks, i.e., whether or not our corporate activities impact ecosystems, is based on the assessment and evidence of ENCORE recommended by TNFD and compared with the Group's operational levels for the WtE Business. We are comparing the operational data and environmental data held by us with the above ENCORE assessment to assess the impacts on natural capital and dependencies on ecosystem services on a five-level scale (Very High, High, Medium, Low, Very Low) following ENCORE. (The method of proceeding with the assessment using ENCORE is explained in Section 4.1.3.)

In regard to quantitative assessment, for procurement, regions and processes are estimated using supply chain load values (secondary data) estimated by aiESG on the International Input-Output Table, and for supplier plants, according to environmental assessments and information on incidents that has occurred. For plants that we have contracted to operate as subsidiaries (SPCs), we assess them based on publicly available operating information.

Going forward, we will work to expand the scope and improve the availability of data on dependencies and impacts, as well as upstream and downstream of the value chain, and will conduct further analysis based on that data as well as regularly review and evaluate identified risks.

5.2 Integration of Nature-related Risks management processes and organization-wide risk management

As a plant engineering company, any failures or damages to the plants the Group work on could result in environmental degradation for our customers. For this reason, risks and opportunities management is a key priority, with governance on a plant order basis.

However, focusing solely on the environmental degradation risk of each individual project will not allow us to adequately address medium- to long-term risks. In view of the various social issues, including those related to natural capital, the Group has identified seven *pillars of success* (Materialities) from the perspectives of society and stakeholders, as well as the impacts on business continuity, and has identified risks and opportunities associated with each materiality.

The Sustainability Promotion Committee, chaired by the president of Kanadevia corporation, and comprising general managers, business site heads, and Group company presidents, engages in comprehensive discussions regarding the entire value chain and mid- to long-term risks related ESG issues. The Sustainability Promotion Department, which serves as the secretariat for the Sustainability Promotion Committee, identifies issues based on the performance and progress of Kanadevia's business sites that are considered to be high-priority in terms of Nature-related Risks. This initiates dialogue at the Sustainability Promotion Committee, and critical risks are communicated to the Management Strategy Committee, enabling management to identify and address issues promptly. In addition, sustainability-related matters are addressed at the Board of Directors, which are held twice a year. At least once a year, the meetings address medium- to long-term risks related to ESG issues based on discussions at the Sustainability Promotion Committee and the Management Strategy Committee, enhancing the efficacy of governance.

In the process of formulating the medium-term management plan, potential business risks are identified, analyzed and evaluated, and specific risk mitigation strategies are considered before the plan is finalized. The progress of the medium-term management plan is reviewed every six months in a meeting led by the president of Kanadevia corporation, and any necessary adjustments to the plan are made in response to changing business risks. Going forward, the Group plans to implement a system that will allow us to prioritize business risks and set evaluation indicators to manage them effectively. We also intend to implement a system that will allow us to manage group-wide risks and emerging risks.

Finally, to promote environmental conservation activities in our business operations, the Group has established the Basic Environmental Conservation policy and has built, maintained, and operates an environmental management system based on ISO 14001 and the environmental laws and guidelines of each country and region. These elements are mutually reinforcing and are promoted in a coordinated manner, as illustrated in Figure5-1.

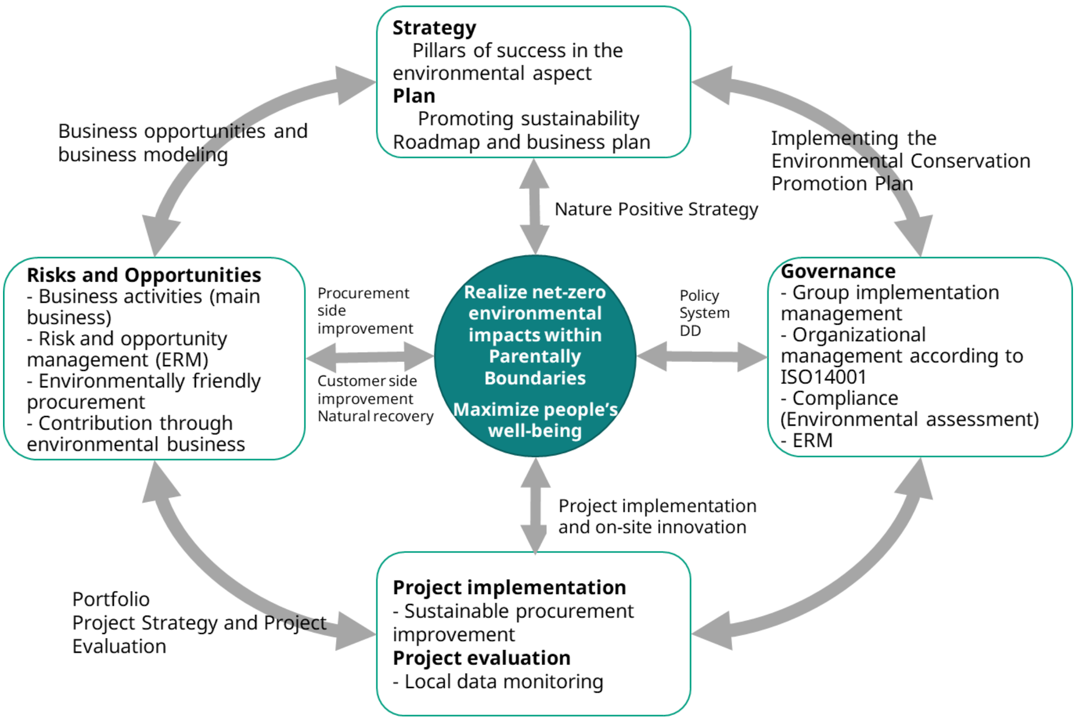


Figure 5-1 : Integration of natural risks management process and organization-wide risks management

6. Metrics and Targets

6.1 Core global disclosure indicators and metrics for nature-related dependencies and impacts

Table 6-1 shows the Group's disclosure indicators for "Land / Freshwater / Marine Use and Changes", "Pollution / pollution removal", "Resource use / replenishment" and so on, which are indicators for dependencies and impacts that the TNFD recommends disclosure of.

The "WtE Business" column for "Kanadevia performance" in Table 6-1 includes the combined values of Kanadevia Corporation and its SPCs (Kanadevia Corporation's subsidiaries in Japan), hereinafter collectively referred to as "Kanadevia Japan", and Kanadevia Inova AG and its SPCs (Kanadevia Inova's subsidiaries), hereinafter collectively referred to as "Kanadevia Inova". Furthermore, estimates provided by aiESG are utilized to assess the total environmental impacts of procured gods (including services) related to the target business. We are unable to disclose certain items at this time due to a lack of information, but we will disclose this information as soon as it becomes available.

Targets based on this analysis will be shown in Section 6.2.

Table 6-1 : Global core disclosure indicators for the WtE Business

TNFD Global Core Disclosure Indicators				Kanadevia performance		
No.	Indicators	Metrics	unit	Procurement *1	WtE Business *2	Remarks
C1	Land / Freshwater / Marine Use and Changes					
C1.0	Total Spatial Footprint	**Total spatial footprint (total):**	1,000m²		**1,468**	
		The total surface area under the supervision and control of the organization		-	1,468	
		Of the above, the total area disturbed		-	51	Three plants to start operation in FY2023
		Total area that has been restored or restored out of the total area disturbed		-	-	
C1.1	Extent of change in land/freshwater/marine use	Extent of change in terrestrial, freshwater and marine ecosystem use	1,000m²	-	12	Changed farmland to business site
		Scope of conservation or restoration of terrestrial, freshwater and marine ecosystems	1,000m²	-	-	
		Extent of sustainably managed terrestrial, freshwater and marine ecosystems	1,000m²	-	-	
C2	Pollution/ pollution removal					
C2.0	Pollutants released to soil split by type	Pollutants released to soil by type, referring to sector-specific guidance on types of pollutants.	1,000kg	-	No contamination incidents have been confirmed.	Although several minor oil leaks were confirmed, they were managed through seepage and leakage prevention measures and rapid response after the oil leaks occurred.
C2.1	Wastewater Discharge	Volume of water discharged, split into total, freshwater, other	1,000m³	4,031	208	The procurement amount is Grey Water Footprint[29]
		Concentrations of key pollutants in the wastewater discharged, by type of pollutant, referring to sector-specific guidance for types of pollutants	-	-	Living environment items (pH, BOD, SS, COD, TN, TP, etc.) are below the regulated value	Data for our plants and offices related to the WtE Business is not disclosed. For information on the Group, including our plants and offices, please refer to the Annual Environmental Data Report (FY2023).
		Temperature of water discharged, where relevant.	-	-	The cooling water at biomass power plants is kept at a temperature around air temperature, or at most below 35°C. There are no other factors that would cause the temperature to rise in other facilities .	

*1 Estimated by aiESG

*2 The scope of the audit covers our offices and factories related to the WtE Business, plants where Kanadevia Japan (including SPCs) perform O&M (operation and maintenance) , and plants where Kanadevia Inova (including SPCs) performs O&M.

[29] Grey Water Footprint is the amount of dilution water required to restore water polluted by pesticides, fertilizers, mining and industrial by-products to a given level.

TNFD Global Core Disclosure Indicators				Kanadevia performance		
No.	Indicators	Metrics	Unit	Procurement	WtE Business	Remarks
C2.2	Waste generation and disposal	Weight of hazardous and nonhazardous waste generated by type, referring to sector-specific guidance for types of waste.	1,000kg	-	1,333	• All figures are for domestic emissions in fiscal year 2023 . • The amount of incineration residue generated at the facilities that we are contracted to operate has not yet been tallied, but we are considering tabulating it in the future. The amount is being properly disposed of using a managed disposal method. • Thermal recycling is for industrial waste, while landfill disposal is for materials that are not suitable for fermentation. • The targets of material recycling and chemical recycling are dried sludge and cinders.
		Weight of hazardous and non-hazardous waste disposed • Thermal recycling • Landfill disposal • Others	1,000kg	-	**898** 274 624 -	
		The amount of hazardous and non-hazardous waste discarded that was avoided from being sent to landfill (excluding thermal recycling) • Reuse • Material recycling, chemical recycling • Others	1,000kg	-	**435** - 435 -	
C2.3	Plastic pollution	Plastic footprint as measured by total weight of plastics (polymers, durable goods and packaging) used or sold broken down into the raw material content.	1,000kg	-	Counting	• At bases where WtE projects are carried out, plastic waste generated from facilities where management, sales, development, design, etc. are carried out is thermally recycled. • There is no plastic used in the WtE/WtX process . • We do not know the weight of plastics contained in household waste, which is the raw material for the WtE and WtX processes . However, we are developing businesses and technologies for separating plastics contained in household waste and chemical recycling methods.
		For plastic packaging materials, the percentage of plastic that falls into the following categories: • Re-usable • Compostable • Technically recyclable • Recyclable in practice and at scale	%	-	Counting	

TNFD Global Core Disclosure Indicators				Kanadevia performance		
No.	Indicators	Metrics	Unit	Procurement	WtE Business	Remarks
C2.4	Non-GHG air pollutants	Non-GHG air pollutants (tonnes) by type : Particulate matter (PM2.5 and/or PM10) Nitrogen oxides (NO_2, NO and NO_3) Volatile Organic Compounds (VOCs or NMVOCs) Sulphur oxides (SO_2, SO, SO_3, SOx) Ammonia (NH_3)	1,000kg	PM10 : 1,556 NOx : 1,747 NMVOC : 927 SO_2 : 1,759 NH_3 : 1,095	At the facilities we are contracted to operate, we properly treat the following items by setting levels below the regulated values or at levels that are 10 times stricter than the regulated values . (soot, sulfur oxides, nitrogen oxides, hydrogen chloride, mercury, dioxins)	Data for our plants and offices related to the WtE Business is not disclosed. For information on the Group, including our plants and offices, please refer to the Annual Environmental Data Report (FY2023).
C3	Resource use/ replenishment					
C3.0	Water withdrawal and consumption from areas of water scarcity	Water withdrawals and consumption from water-scarce areas (including identification of water sources)	1,000m^3	1,781	-	• Procurement will be based on the Blue Water Footprint[30] • The WtE Business does not take water from areas with water shortages. The location of each facility is determined based on the results of environmental assessments by the client, and areas with abundant water resources are selected.
	Quantity of high-risk natural commodities sourced from land/ocean/ freshwater	Quantity of high-risk natural commodities sourced from land/ocean/freshwater, split into types, including proportion of total natural commodities. • Biomass • Ores • Building materials • Fossil fuels • Iron ore • Copper ore • Nickel ore • Lead ore • Zinc ore • Gold • Aluminum ore • Natural gas	1,000kg %	45,628 120,180 318,617 157,290 29,496 51,469 2,653 1,489 2,670 22,314 3,558 27,421	33,600 (33,600)(100%) - - - - - - - - - - -	• The proportion of "high risk natural primary commodities" in "total natural primary commodities" has not been calculated because the total volume of natural primary commodities has not been calculated. • Biomass procured through the WtE Business is fuel for biomass power plants (wood chips obtained from unused materials) . 100% of the amount procured has obtained a "certificate certifying that it is wood biomass derived from thinning materials, etc." from the Forestry Agency. The amount procured is for fiscal year 2022.

[30]The Blue Water Footprint is the amount of surface water, groundwater and irrigation water needed to produce a product or service.

TNFD Global Core Disclosure Indicators				Kanadevia performance		
No.	Indicators	Metrics	unit	Procurement	WtE Business	Remarks
C4	Invasive alien species, and other (placeholder indicator [31])					
C4.0	Measures against unintentional introduction of invasive alien species (IAS)[32]	Proportion of high-risk activities operated under appropriate measures to prevent unintentional introduction of IAS, or low-risk designed activities	-	-	No special measures	
C5	State of nature (placeholder indicator)					
C5.0	Ecosystem condition	Ecosystem condition levels by ecosystem type and business activity	-	-	under consideration	
	Species extinction risk	Species extinction risk	-	-	under consideration	

[31] Placeholder indicator : An indicator that is recommended to be considered and disclosed whenever possible (because it has not yet been standardized).
[32] IAS (Invasive Alien Species): Among the non-native species that have been artificially introduced into areas where they did not originally live, there are those that have a significant impact on the local natural environment and are at risk of threatening biodiversity.

6.2 Targets on natural capital

6.2.1 Relationship between natural capital and the WtE/WtX Business

With our corporate philosophy and *Sustainable Vision* in mind, our Group has identified seven *pillars of success* (Materialities), starting from a long-term awareness of the external environment and an exhaustive identification of issues based on the Four Principles of Sustainability (The Natural Step)[33], and considering the perspectives of society and stakeholders, the impact on business continuity, and the degree of difficulty of achievement (utilizing the Future-Fit Business Benchmarks). [34] Of these, the *pillars of success* that are closely related to natural capital are "*Carbon neutrality*," "*Complete circulation of resources*," "*Maximize environmental resilience*," "*Response to intensifying disasters*," and "*Sustainable procurement*".

In this report, the WtE Business and other businesses covering the entire world are analyzed, taking into account business scale, impacts on natural capital, and evaluability from the business areas indicated in the mid-term management plan. As a result, it was found that in the WtE/WtX Business, direct involvement in natural capital is heavily and variously biased in favor of customers' decision-making. This is because we are plant engineering companies for the WtE/WtX facilities. In the WtE/WtX Business, we exclusively design the WtE/WtX facilities, according to the specifications and environmental performance described in the customer's RFP, procure equipment and materials, construct and coordinate them on-site, and deliver them. The Group is involved in the manufacture of only a few pieces of equipment. As plant engineering companies, we are committed to avoiding the environmental impacts of our suppliers through activities such as raising awareness and sharing know-how, as well as enhancing its environmental technologies and improving the environmental quality of our proposals to customers, in other words, promoting the WtE/WtX Business strategy (see Section 4.5.1 and Figure 4-4), directly related to our goals regarding natural capital.

6.2.2 Ideal state of the WtE/WtX Business in 2050

In light of the above, the goals for the WtE/WtX Businesses have been redefined the perspective of natural capital-related goals (see Table 6-2). The goals related to water and biodiversity are no longer set as goals to be achieved by the WtE/WtX Business. Instead, they are positioned as goals to be achieved by the Group through its water business, nature restoration business, and other businesses.

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[33] See note 3.

[34] The Future-Fit Business Benchmarks is a KPI tool created to apply the four principles of sustainability to the perspective of promoting sustainable management in companies. It is based on social and natural sciences, and ultimately sets "absolute" goals that all companies are expected to achieve, regardless of their products or services. https://futurefitbusiness.org/

Table 6-2 : Outlines the natural capital-related goals for the WtE/WtX Business

Field	Goals	Meaning (For details, see sec.6.2.2.1 to 6.2.2.5 and Appendix3)
GHG Emissions	Carbon Neutral	Carbon neutral for our Group and our customers (In the case of customers, this includes the amount of avoided emissions)
Plastic Emissions	Zero plastic load	Working with manufacturers to achieve 100% plastic recycling
Land area utilization	Zero impact from Land area utilization	Minimize waste landfills for our customers
Ores Usage burden	Zero ores usage burden	Minimizing newly mined ores through recycling
Burden of hazardous chemicals	Achieving zero emissions standards	Establishing and adhering to voluntary standards that align with the most stringent standards in each country or region that apply to the sites and facilities it operates, as well as to the WtE/WtX Facilities operated by its customers

6.2.2.1 GHG Emissions

In regard to GHG emissions, our goal is to achieve carbon neutrality.

The Group's definition carbon neutrality entails achieving net-zero emissions (including the use of credits) for Scope 1 and 2. We will work to convert the fuels in the manufacturing process to carbon-neutral fuels, improve our energy self-sufficiency, and introduce energy-saving equipment in a systematic manner.

In regard to carbon neutrality across the value chain, our goal is to ensure that the GHG emissions avoidance associated with the Group's products and services to exceeds Scope 3 emissions. The term "GHG emissions avoidance" refers to the quantities of GHG emissions derived from fossil fuels that are not utilized as a consequence of the implementation of the WtE/WtX Facilities. For further details on the GHG emissions avoidance associated with the installation of the WtE/WtX Facilities, please refer to Section 6.2.4.

In regard to the carbon neutrality of suppliers, our goal is to reduce emissions of Scope 3, Category 1. As detailed in Appendix 2.2, significant GHG emissions are associated with steel manufacturing, power generation, and infrastructure construction. To address this, we will promote awareness-raising activities towards decarbonization, share methods and expertise for managing and reducing GHG emissions, and work to disseminate the Basic Procurement Policy to our suppliers.

For customers to achieve carbon neutrality, the key is to minimize Scope 3, Category 11 emissions. In the case of the WtE Facilities specifically, the percentage of plastic in general waste has a direct impact on the GHG emissions, with lower percentages result in lower emissions. Consequently, we will collaborate with our customers to enhance plastic sorting technology and encourage sorting at the source.

In alignment with the aforementioned goals, we have established targets for the following items (See Table 6-3). Once we have engaged with the relevant stakeholders, we will consider Scope 3 targets and targets for suppliers and customers to become carbon neutrality.

Table 6-3: GHG Emissions Targets (up to 2050)

Field	Targets	Meaning
GHG Emissions (Scope 1, 2)	By FY 2025, 34% less GHG emissions than in FY 2013 BY FY2030, 50% less GHG emissions than in FY2013 Become carbon neutral by FY 2050	We will implement measures to reduce GHG emissions resulting from our own business activities and will aim to achieve the target. Should they be unable to achieve the target through our own efforts, we will utilize credits.

6.2.2.2 Plastic Emissions

In regard to plastic emissions, our goal is to collaborate with manufacturers to promote 100% recycling of plastics.

The Group will reduce its use of plastic in order to minimize the volume of plastic generated. In the use plastic, priority will be given to recycled materials and plastic products designed for easy separation, with disposal occurring separately. By implementing these measures, our goal is enhance the recycling rate of plastic materials utilized within the Group.

In order to reduce the burdens of plastic products contained in equipment and components used in the WtE/WtX Facilities, it is essential that customers and suppliers understand the importance of recycled plastic products and that plastic manufacturers develop recycling technologies. The Group requests that our suppliers proactively suggest recycled plastic products that are comparable in quality to those made from new materials. We also provide detailed recommendations to our customers to enhance their understanding of recycled plastic products. In order to achieve 100% recycling of plastics, it is essential to develop technology that can separate the plastics that will be recycled. As previously mentioned in the GHG emissions section, sorting at the source and improving sorting technology can also be measures in this field. We will pursue business and technology development, including establishing a route for plastic manufacturers to take back the separated plastics.

We will continue to collaborate with relevant stakeholders to consider targets based on the above goals in the future.

6.2.2.3 Land area utilization

In regard to Land area utilization, our goal is to minimize the number of waste landfill sites for our customers.

As illustrated in Figure 4-4, at the initial stage of the maturity of efforts to address waste issues in the community and society, the volume of landfill waste can be reduced to 3% of the volume generated simply by installing a waste incinerator. Since the volume of waste generated in the world in 2050 is expected to be enormous, to proactive implementation of the business proposals outlined in Figure 4-4 will help to mitigate the burden of land use.

Regarding the burden caused by waste, we have set the following two targets (Table 6-4) based on our analysis of the Global Core Disclosure Indicators . Our first target is to achieve zero emissions in order to reduce the burden caused by waste generated by our own business activities. Our target is to enhance the recycling rate of waste generated from the Group's business sites and to minimize the final landfill rate as much as possible (landfill rate of less than 1%). Next, in order to reduce the burden caused by waste generated by our customers' business activities, we will develop businesses and technologies to recycle incineration residues such as bottom ash and fly ash (air pollution control residue). Our target is to achieve a resource conversion rate of 95% or higher for incineration residues.

Table 6-4: Land area utilization targets derived from Global Core Disclosure Indicators (up to 2050)

Field	Targets	Meaning
Waste burden (Our business activities)	Achieving zero emissions standards	Enhancing the recycling rate of waste generated at our facilities and minimize the final landfill rate to the greatest extent feasible
Waste burden (Customer business activities)	Incineration residue recycling rate: 95 % or more	Developing business and technology solutions that facilitate the recycling of incineration residues, including bottom ash and fly ash, generated by customers

6.2.2.4 Ores Usage Burden

In regard to the impact of ores usage, our goal is to minimize the use of newly mined ores through the implementation of recycling initiatives.

It is essential that we select appropriate recycling companies for waste generated from our own business activities and that we reuse the ores contained in waste. As previously stated with regard to plastic waste, we will also collaborate with manufacturers, suppliers and customers to promote the utilization of recycled materials that are equivalent in quality to new materials.

Moreover, in order to achieve a state of zero ores usage, it is necessary to develop technology capable of separating metals following the recovery of products. The enhancement of separation technology, as previously mentioned in the GHG emissions section, can also be a measure in this field. We will pursue the advancement of business and technology with the objective of promoting ores recycling.

We will continue to collaborate with relevant stakeholders to consider targets based on the above goals in the future.

6.2.2.5 Burden of hazardous chemicals

In regard to hazardous chemical burdens, our goal is to achieve zero emissions levels for our own operations and our customers' WtE Facilities.

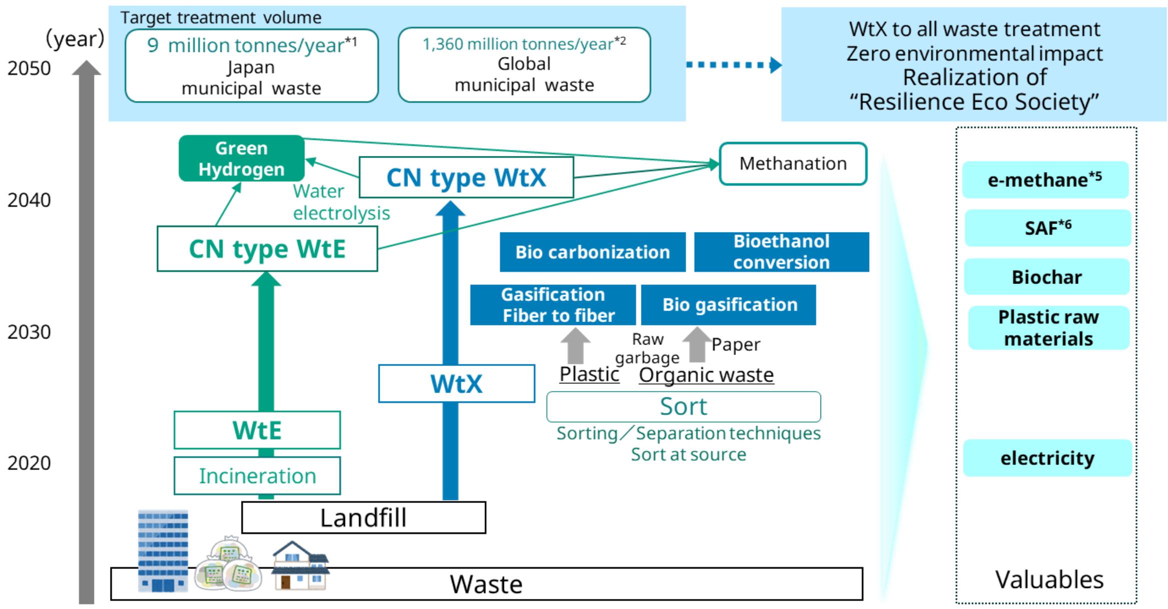
Many countries and regions have established stringent regulatory limits for the use and discharge of hazardous chemical substances, and we are obliged to comply with these regulations in our business activities and in the operation of our customers' WtE Facilities. However, some countries and regions have no regulatory limits, or even if they do, they are implemented laxly. In the Group's business activities and when we are contracted to operate the WtE Facilities that we are contracted to operate, we set stricter voluntary standards based on the strictest regulatory values set in each country and region in which we operate, and we strive to achieve these values. For example, in Japan, the Air Pollution Control Act sets standard values for dioxins, HCl, NOx , and SOx contained in the exhaust gas from the WtE Facilities that are assumed to have no effect on the human body, and local governments set standards that are stricter than these standards. Many of the WtE Facilities that we are contracted to operate adopt standard values for toxic gases that significantly exceed the standards set by these laws and regulations, and manage them using the specified methods and frequency.

In addition, we require that suppliers who directly or indirectly enter into contracts with the Group understand the Basic Procurement Policy, which also refers to environmental management. As part of environmental management, we will raise awareness among our suppliers to encourage them to proactively manage hazardous chemical substances.

We will continue to collaborate with relevant stakeholders to consider targets based on the above goals in the future.

6.2.3 Business strategies to achieve the goals of the WtE/WtX by 2050

The Group has proposed the "***Resilience Eco Society***," a world where waste is not wasted, as a vision of a circular economy that achieves "*Realizing net-zero environmental impacts within Planetary boundaries*". "*Realizing net-zero environmental impacts within Planetary boundaries*" that our Group aims for is defined as keeping the environmental impacts resulting from our own business activities, as well as the environmental impacts of our Group's supply chain, and the environmental impacts of our customers who use our Group's products and services, within the range of the region's inherent environmental resilience. To achieve this, we will work on the goals and targets described in Section 6.2.2 to reduce the environmental impacts resulting from our own business activities, as well as the environmental impacts of our suppliers and customers. These goals and targets are integrated with our business strategy of evolving from our current WtE Business to an energy supply business. a material and chemical recycling business. The business strategies of the WtE/WtX Business are shown below (Figure 6-1).



*1 The projected amount of Japan municipal waste generation in 2050 (18 million tonnes/year*3), with our share being 50% of that value
*2 The projected amount of global municipal waste generation in 2050 (3,401 million tonnes/year*4), with our share being 40% of that value (including Inova)
*3 "Mid- to Long-Term Scenario (Draft) for Achieving Net Zero Greenhouse Gas Emissions by 2050 in the Waste and Resource Circulation Sector" (Ministry of the Environment, 2021)
*4 "What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050" (World Bank)"
*5 e-Methane: Synthetic methane produced from CO2 and hydrogen using renewable energy, a carbon-neutral fuel that can be used in existing natural gas systems.
*6 SAF (Sustainable Aviation Fuel): Renewable fuel that reduces aviation's carbon footprint, produces from sustainable sources such as waste oil and biomass.

Figure 6-1 : Business strategies to achieve the goals of the WtE/WtX Business in 2050

6.2.3.1 Global waste management and New energy supply projects towards 2050

The amount of waste generated worldwide is expected to reach approximately 14 billion tonnes per year in 2025 and approximately 32 billion tonnes per year in 2050[35]. Of this, municipal waste to be treated by incineration or other methods is expected to amount to 3.4 billion tonnes, as shown in Figure 6-2.

To treat enormous amount of waste, the Group will develop its WtE Business in various countries and regions, including Asia and the Middle East. When waste is incinerated, the volume is reduced to approximately 3% of the amount generated, depending on the specifications of the plant to be installed. If the Group were to achieve 40% share of the annual treatment volume, approximately 1.4 billion tonnes of waste would be treated annually, and the amount of incineration residue that would be landfilled would be approximately 150 million tonnes per year. This would reduce the amount of land disturbed for landfill to less than one-thirtieth[36], compared to when the entire amount is landfilled without incineration.

On the other hand, if the annual amount of waste processed by the WtE Business reaches 40% of the global total in 2050 , the amount of CO_2 generated by incineration will be enormous, not to mention the need to simultaneously implement GHG reduction measures.

[35] See note 25.
[36] Waste to be incinerated and the incineration residue to be 0.25t/m^3, 1.0t/m^3 , respectively, the weight reduction rate is calculated to be approximately 1/37.

Currently, we are developing waste incineration plant based on CO_2 separation and capture, and we will complete the development of this technology by 2030, and in 2040, we will develop a carbon-neutral WtE Business equipped with this technology. If waste incineration plant based on CO_2 separation and capture is introduced at plants and approximately 10 million tonnes are treated per year, it is calculated that approximately 3 million tonnes of e-methane can be used from the captured CO_2 using methanation technology[37]. However, in order to convert all the captured CO_2 into e-methane, cheap green hydrogen[38] is essential and large storage batteries are also required. In addition, CO_2 that cannot be used even with that will need to be stored. And we already have technologies for wind power generation, hydrogen production plants, electrolysers, methanation technology and solid-state batteries[39], and we intend to work on this business through technology and business collaborations along the entire value chain, including CO_2 storage and large storage battery technology.

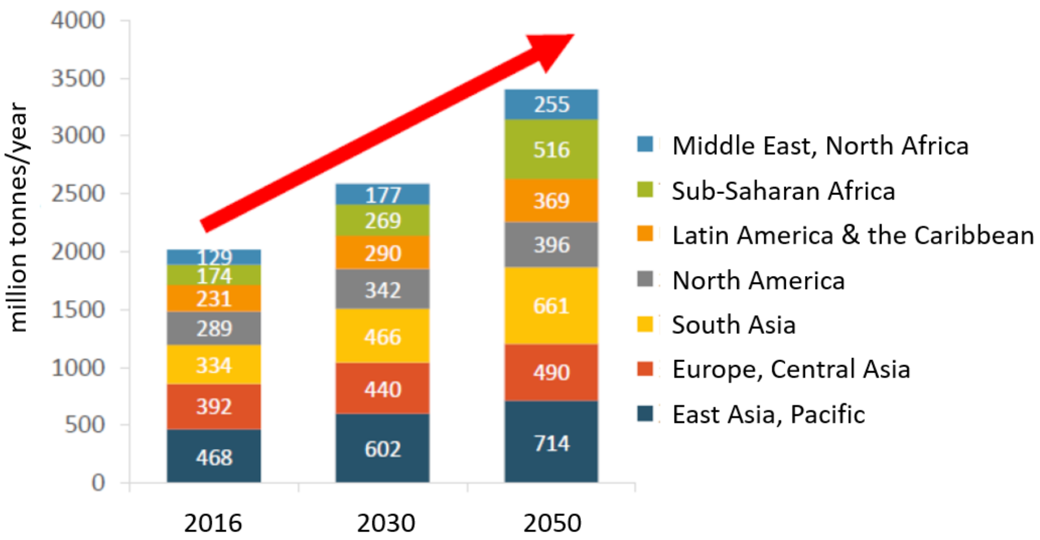


Figure 6-2: Global outlook for municipal waste generation[40]

6.2.3.2 Global waste treatment and material/chemical recycling business towards 2050

In the "***Resilience Eco Society***," the world where not wasting anything is, we can assume that material and chemical recycling will progress in various ways in addition to the WtE.

The Group is currently developing the waste incineration plant based on CO_2

[37] Estimated with 1 tonne of CO_2 emissions per ton of incinerated waste, 90% CO_2 capture rate, and 90% conversion rate to methane.
[38] Green hydrogen is hydrogen that does not emit CO_2 during combustion or production because it is produced using renewable energy.
[39] Sustainable GUIDE BOOK：
https://www.kanadevia.com/sustainability/environment/pdf/hitz_sustainable_guide_book.pdf
[40] The World Bank's "What a Waste 2.0" (2018) data on the current state and outlook for global waste management toward 2050 is reprinted from the Ministry of the Environment's document "Research and Development and Social Implementation Directions for the Achieving Carbon Neutrality in the Waste and Resource Recycling Sectors" project in 2023.

separation and capture, as well as technologies for producing biochar, gasification, bioethanol, SAF, etc. from waste. With the exception of a few of these technologies, we plan to commercialize them in Japan by 2030.

For example, food waste treated as municipal waste can be used as a raw material for biogas by applying anaerobic digestion technology. Figure 6-3 shows the estimated amount of food waste generated in Japan in 2050. If anaerobic digestion technology is applied to the entire amount of food waste (4.6 million tonnes per year) in 2050 , approximately 350 million Nm^3 of biomethane can be obtained [41].

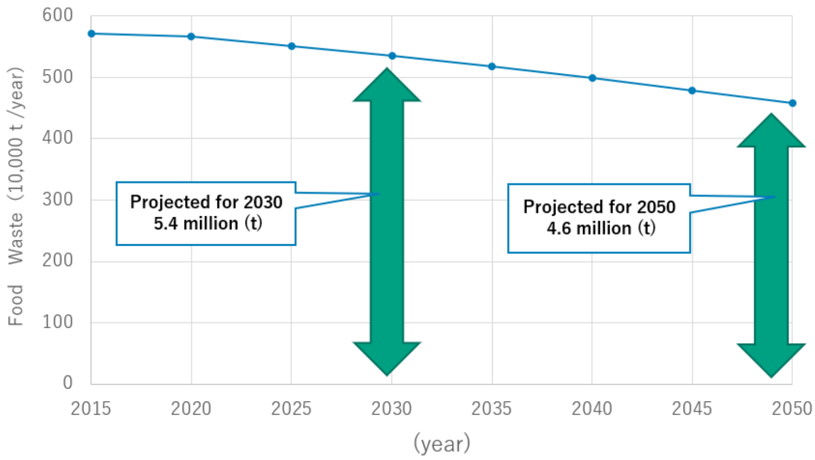


Figure 6-3 : Estimated amount of food waste generated in 2050 (Japan)[42]

In 2050, the world will be generating approximately 32 billion tonnes of waste. It is unclear how much of this food waste will be suitable for WtX technology. However, given that the type and quality of waste is becoming more uniform due to accelerating globalization, it is highly likely that the analysis based on information available in Japan will be applicable. Therefore, we can expect to see benefits from WtX technology.

The amount of industrial waste generated in Japan is about 10 times the amount of general waste, and this trend has not increased or decreased much since 1990, with progress in recycling and reduction leading to only 9 million tonnes of final treatment in 2022. And, looking at industrial waste by type, sludge (42%), animal manure (22%), and rubble (17%) account for 80% of the total. Sludge and animal manure have high moisture content, making them difficult to burn, let alone use as raw materials for chemical recycling , and therefore are not prerequisites for setting targets.

In order to apply these technologies , it is essential to promote waste separation at the source, establish collection methods, and form alliances and collaborations with companies that have advanced sorting technologies. Therefore, in this field as well, we will actively promote collaboration with other businesses and build a cooperative system with various stakeholders involved in waste treatment .

[41] 150 Nm^3 of biogas is generated from 1 tonne of food waste , and the concentration of biomethane in the biogas was assumed to be 50%.

[42] Created by Kanadevia based on the amount of food waste generated at one sample site in Japan. Calculated based on the predicted population change in Japan (Cabinet Office, 2022 White Paper on Aging Society) assuming food waste generation of 0.123 kg/person/day.

6.2.4 Simulation toward "Realizing net-zero environmental impacts within Planetary boundaries" for customers

6.2.4.1 Purpose and Overview of Simulation

The Group's long-term goal is to "*Realize net-zero environmental impacts within Planetary boundaries*"[43] by 2050 and to realize the "***Resilience Eco Society***." At the core of this is the WtE Business, which is the subject of this report . To demonstrate the contribution of the WtE Business strategy to "*Realize the net-zero environmental impacts within Planetary boundaries*[44]" of the local community, we will use simple simulations. The simulations are conducted using analytical technology from aiESG. It should be noted that the simulations are limited to the WtE Business because, as while the WtE Business can be evaluated quantitatively, there is currently a lack of information available for the WtX Business, making evaluation challenging.

These simulations measure the outcomes of the WtE Business strategy for the year 2050 in terms of environmental impact performance. The three outcomes of the strategy are: sales effectiveness (new installation effectiveness), plant engineering effectiveness, and digital automation effectiveness (operational cost reduction). Environmental impact performances are the environmental impact avoidance contribution performances obtained in 2050 as results of implementing the strategies.

First, the avoidance contribution performances in 2050 are estimated in comparison with the total environmental impacts of the supply chain associated with the WtE project. The next step is to estimate how many new WtE Facilities, enhanced by this strategy, would need to be delivered in 2050 to achieve enough of a reduction contribution to offset the environmental impacts of the supply chain (Section 6.2.4.3 and Table 6-6 below).

The analytical technology of aiESG enables the estimation of various environmental impacts in the supply chain using secondary data (macro statistics) such as procurement slips and the International Input-Output Table related to the target business. This value is then used to analyze the level at which the environmental impacts are offset by the expected reduction avoidance performances from the implementation of the strategy (Section 6.2.4.4 and Table 6-7 below). The target level is indicated by the impacts of each environmental impact item. Additionally to gain a concrete understanding of the scale of business development, the number of facilities to be delivered is estimated by working backwards from the alternative power generation volume corresponding to the level (Section 6.2.4.7, Tables 6-9 and 6-10 below).

6.2.4.2 Assumptions regarding environmental contribution factors

In establishing the assumptions, consideration was given to the technical viability and quantifiability of the strategy (see Section 4.5 and Figure 4-4). The following three performances (environmental contribution factors) at 2050 were selected as key assumptions for the simulation, following the implementation of the strategy. These are presented in Table 6-5.

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[43] See note 13.
[44] See note 13.

(A) Business effects (the WtE Facilities New Installation Effects):

Type of Power Generation (Replacement of Power Generation in the Region)

The implement of the WtE Facilities in areas where they are not currently available will result in the displacement of power generation from existing facilities with electricity generated from waste incineration. This replacements a shift from power generation with high environmental impacts to power generation with low environmental impacts, which can be seen as a contribution to reducing the environmental impacts. Accordingly, the "type of power generation" has been designated as an environmental contribution factor. This is because thermal power generation is considered a target that should be actively reduced in order to decarbonize the areas.

(B) Effects of enhanced plant engineering technology: Equipment Lifespan

To mitigate Physical risks and transform Transition risks into business opportunities, the Group will refine its engineering technology, a core competency, and enhance the environmental performance of its waste incineration power generation facilities. The resulting “standardized” design of the facility will enhance manufacturing technology and operations. In addition, a CCUS (Carbon Capture, Utilization, and Storage) facility will be installed to reduce carbon emissions. The results of these efforts are expected to be reflected in the life of the facility. Therefore, the life extension of the facility is defined as an environmental contribution factor.

(C) Effects of digital automation: Operational costs (reduction)

To operate the WtE Business more efficiently, we will work to improve facility operation and management techniques and make proactive improvement proposals to our customers. Although the introduction of DX equipment for labor-saving purposes leads to higher costs, we assume that this is a temporary effect and that in 2050, service cost reductions will have been realized compared to the current level. Therefore, we will set operational costs as an environmental contribution factor.

The specific assumptions set for each environmental contribution element are outlined in Table 6-5.

Table 6-5 Simulation conditions

Environmental contribution factors	Premise (A and B and C)	Simulation conditions
A. Types of power generation	The introduction of the new WtE Facilities will replace electricity provided by existing power plants.	Electricity from thermal power plants, which have high environmental impacts, is replaced with electricity from the WtE Facilities, which have low environmental impacts.
B. Equipment durability	The durability of WtE Facility equipment will be extended through engineering (manufacturing technology, operational improvements, and standardization of maintenance parts).	The lifespan of equipment will be extended from 30 years to 40 years.
C. Operating Costs	Proposals for operational improvements to the WtE Facilities will reduce operational costs.	10% reduction in service costs

6.2.4.3 Target environmental impacts

The following indicators were selected for the environmental impacts to be covered by the simulation. These indicators are related to the target set for "*Realizing net-zero environmental impacts within Planetary boundaries*."[45] (Section 6.2.2)

Table 6-6 Environmental impacts

CO_2 / Methane /NOx / SO_2 / PM10/ Ores usage / Land area utilization

6.2.4.4 Level of deployment scale used in the simulation

The effects of strategy implementation will manifest themselves in the form of a larger total environmental contribution as the scale of the WtE Business increases. Under simulation conditions, we have estimated the contribution to reduction of environmental impacts (performance of environmental contribution elements), which is the effect of strategy implementation, assuming three levels of business development scale. Estimates are made by comparing the environmental impacts of the WtE Business supply chain in 2050. Since the scale of business development increases in order, the difficulty level of achievement is: level α < level β < level γ.

[45] See note 13 .

Table 6-7 Level of deployment scale used in the simulation

		Difficulty
Level α	CO_2 emissions are offset (The environmental impact from CO_2 emissions has been offset by the amount of reduction contribution and is now zero.)	Low
Level β	Environmental indicators other than ores usage (CO_2, methane, NOx, SO_2, PM10, land area utilization) are "offsetting environmental impacts" by the amount of contribution.	Medium
Level γ	All environmental indicators, including ores usage, will have "offsetting environmental impacts" by the amount of contribution	High

6.2.4.5 Simulation Method

Under simulation conditions, the contribution to reduction of environmental impacts (performance of environmental contribution elements), which is the effect of strategy implementation, is estimated assuming three levels of business development scale.

The total impacts as a business-as-usual (BAU) generated by waste-to-energy (WtE) operations as of 2050 is the sum of two components: (i) the current environmental impacts for the entire supply chain (FY2022, see Section 4.1) and (ii) the impacts that are expected to increase in the future.

(i) Estimate the environmental impacts of the entire current supply chain using the FY2022 environmental impacts values analyzed in Section 4.1. In addition, we assume (ii) a load equivalent to $1 million worth of electricity per year for the load expected to increase in the future. It is challenging to make precise forecasts regarding the status of facilities and procurement in 2050. However, a significant proportion of the anticipated load in future projects can be converted to an electricity equivalent. Accordingly, the assumption of electricity equivalence was applied. For example, new facilities for carbon capture, utilization, and storage (CCUS) and digital transformation (DX) are anticipated to be introduced with the objective of reducing carbon emissions and labor costs. The majority of the new load generated on the part of plant engineering firms to install these systems is expected to be electric power. Furthermore, the $1 million figure was established as a realistic and sufficient amount to prevent overly optimistic simulation, given the inherent uncertainty of the forecast.

Next, thermal power generation was selected as the "existing power generation to be replaced" in Assumption A of Table 6-5. The amount of environmental impacts (i.e., the emission avoidance contribution from replacement) of thermal power depends on the type of fuel used. Therefore, we assume the composition ratio of coal, natural gas, and oil as fuels for power generation in 2050. The IEA (International Energy Agency) forecasts were used for this assumption. Since we were not able to obtain the projected environmental impacts of the coal, natural gas, and oil supply chains in 2050, we used the current environmental impacts based on the assumption that they will remain unchanged from the current level.

6.2.4.6 Simulation results

Once the WtE Facility provides the new generation shown in Table 6-8 and reaches a level of generation that replaces existing thermal power generation, the environmental impacts at each level of conditions are offset by the emission avoidance contribution. This is because power generation using coal, natural gas or oil as fuel has large and varied environmental impacts in terms of extracting new resources from nature, whereas power generation using waste as fuel has smaller environmental impacts in terms of not extracting resources from nature. This is the effect of switching from thermal power generation to power generation from waste incineration.

Table 6-8 Simulation results (summary)

Level		Amount of fossil fuel power generation to be replaced		Remarks
α	Offsetting CO_2 Emissions	Coal-fired Natural gas-fired Oil-fired **Total**	37GWh 98GWh 4GWh **139GWh**	CO_2 reduction contribution (Figure 6-4-1) Substitution effects seen in environmental contribution factors other than CO_2 (Figure 6-4-2)
β	Offsetting environmental impact indicators other than ores usage	Coal-fired Natural gas-fired Oil-fired **Total**	111GWh 293GWh 13GWh **417GWh**	CO_2 reduction contribution (Figure 6-4-3) Substitution effects seen in environmental contribution factors other than CO_2 (Figure 6-4-4)
γ	Offsetting environmental impact indicators, including ores usage	Coal-fired Natural gas-fired Oil-fired **Total**	237GWh 625GWh 27GWh **889GWh**	-

- Environmental impacts at the time of achievement of level α

Figure 6-4-1 illustrates the quantity of CO_2 avoided emissions at the time of achieving level α. The blue bar graph illustrates the aggregate impacts of the entire supply chain, while the orange bar graph depicts the amount of CO_2 avoided emissions. The amount of avoided emissions represented by the orange bars exceeds that represented by the blue bars. The breakdown of the amount of emissions avoided in orange shows that the majority of the contribution comes from reduced power generation, while reduced service costs and increased equipment lifespan have a relatively small impact. The simulation demonstrates that the most effective environmental contribution element in the WtE business is (A) the replacement of power generation (from thermal power generation to WtE) due to the business effect (new installation effect), rather than (B) the increase in service life due to improved plant engineering technology or (C) reduced operating costs due to digital automation. This highlights the significant impact of building a new waste-to-energy facility where none exists.

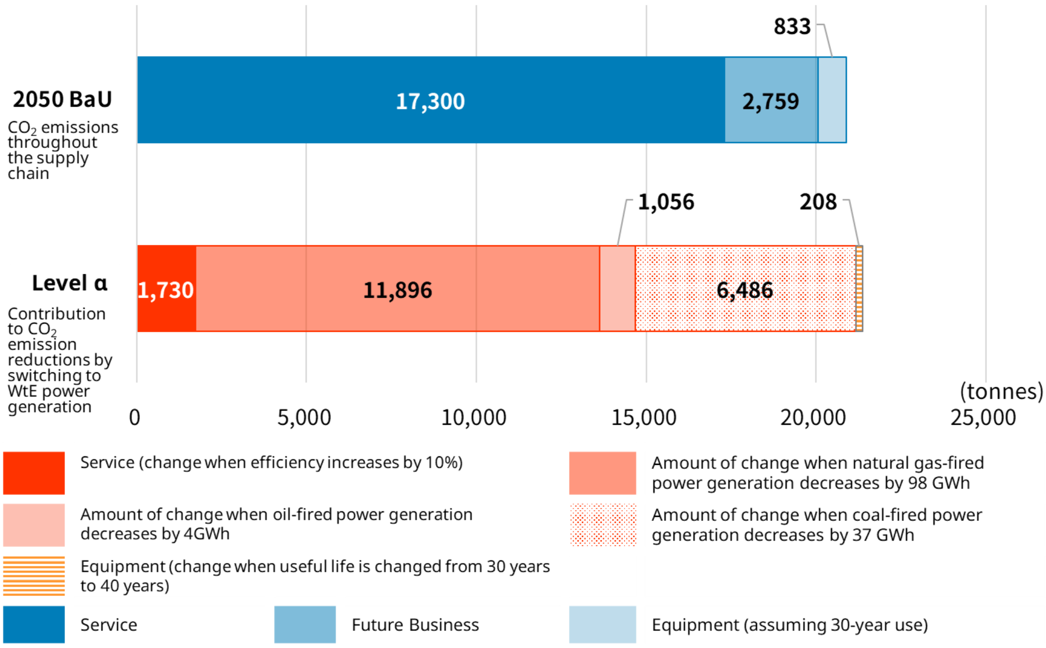


Figure 6-4-1 The amount of CO_2 reduction contribution achieved by replacing power generation with WtE (Level α)

Figure 6-4-2 illustrates the status of CO_2 emissions and other environmental impacts upon attainment of level α. The orange indicator shows the environmental impacts that would result if preconditions A, B, and C of the environmental contribution elements were to be met in 2050, along with level α being achieved. The blue indicator represents the environmental impacts in the event that preconditions A, B, and C are not met by 2050 and level α is achieved. The environmental impact of the scenario (blue) in which the preconditions are not realized is set to zero, and the environmental impact of the scenario (orange) in which the preconditions are realized and level α is achieved is shown in relative terms.

The orange areas indicate smaller values for CO_2 and NOx emissions, which indicates a lower environmental impact. However, at level α, the reduction contribution effect is not large enough to offset the environmental impact of other environmental impact items. (The reason why the reduction in NOx emissions is relatively greater than the reduction in CO_2 emissions is currently under analysis.)

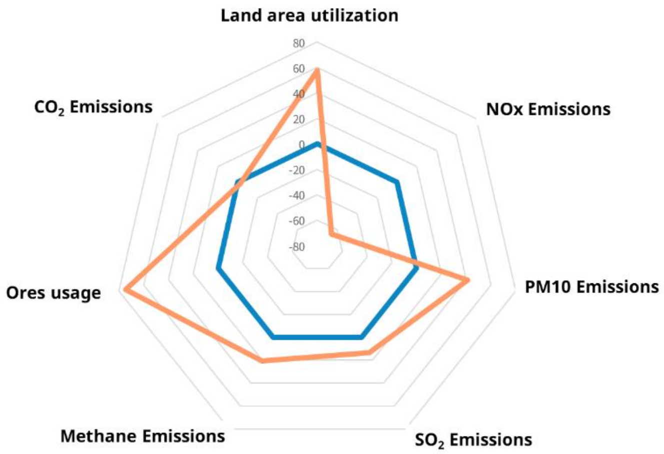


Figure 6-4-2 Level α achieved

How to read the chart：
(Blue) Environmental impact in 2050 BAU (when preconditions A, B and C are not realized but level α scale is reached)
(Orange) Environmental impact if preconditions A, B and C are realized and level α scale is achieved.

The inner side indicates a smaller environmental impacts (greater contribution to environmental impacts).

- Environmental impacts at the time of achievement of level β

Figure 6-4-3 illustrates the point at which the level β is reached. It can be seen that the orange bar of the emissions avoidance contribution is even larger than when level α is reached.

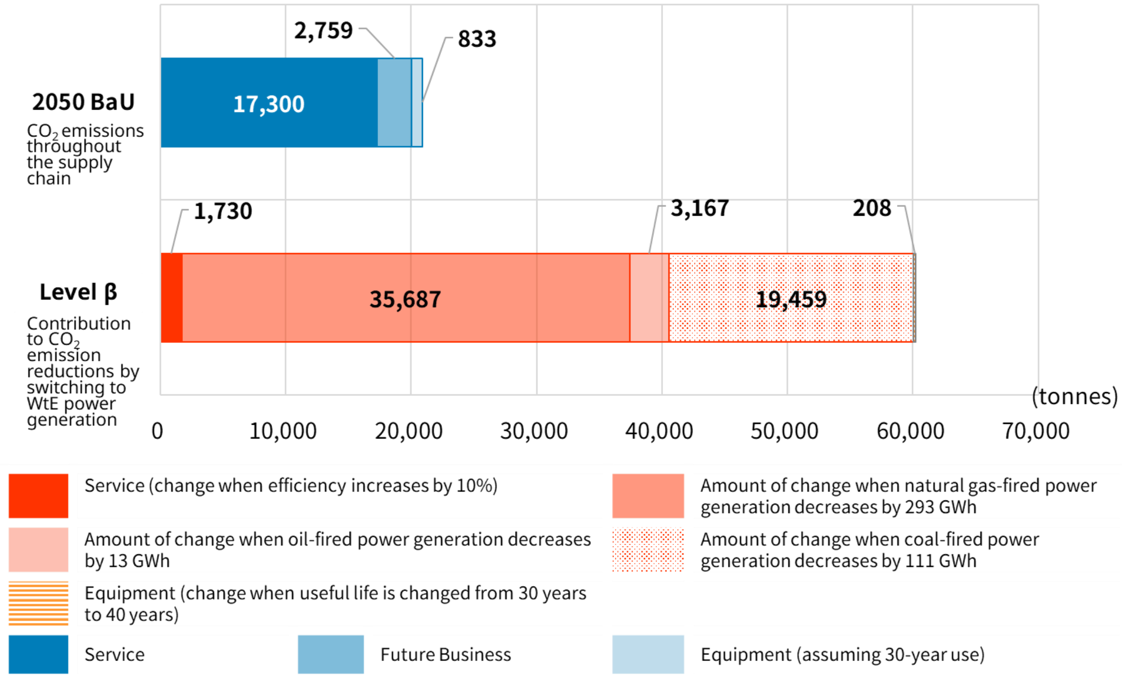


Figure 6-4-3 The amount of CO_2 reduction contribution by replacing power generation with WtE (Level β)

Figure 6-4-4 illustrates the status of CO_2 emissions and other environmental impacts upon attaining Level β. For indicators other than ores usage, we can see that if preconditions A, B, and C of the environmental contribution factors are realized in 2050 and Level β is achieved, the environmental impact (orange) will be lower than the environmental impact (blue) if the preconditions are not realized. Notably, CO_2 emissions, NOx emissions, SO_2 emissions, and methane emissions are substantially reduced. These trial calculation results demonstrate that the expansion of the WtE Business will make a substantial contribution to reducing the environmental impacts.

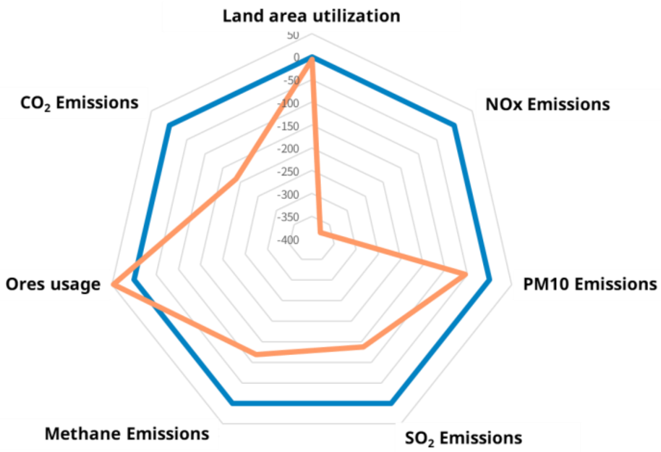


Figure 6-4-4 Level β achieved

How to read the chart：
(Blue) Environmental impact in 2050 BAU (when preconditions A, B and C are not realized but level *β* scale is reached)
(Orange) Environmental impact if preconditions A, B and C are realized and level *β* scale is achieved.

The inner side indicates a smaller environmental impacts (greater contribution to environmental

6.2.4.7 Number of the WtE Facilities required to meet alternative power generation needs

We evaluated the scale of the WtE Facilities that our Group would require to meet the three aforementioned standards. We estimated the number of the WtE Facilities of each scale (large, medium, and small) that would need to be delivered annually to achieve the three standards.

Table 6-9 Types of waste incineration facilities

Scale	Processing volume	Power Generation Capacity	Annual power generation
Large	1,000,000 kg /day	26,000kW	208GWh
Medium	300,000 kg /day	7,800kW	62GWh
Small	80,000 kg /day	2,000kW	16GWh

Table 6-10 Number of waste incineration power generation facilities required to achieve levels α, β, and γ

Level	Amount of fossil fuel power generation to be replaced		Example of estimated delivery quantities*		
			Large	Medium	Small
α	Coal-fired	37GWh	-	2	1
	Natural gas-fired	98GWh			
	Oil-fired	4GWh			
	Power generation total	**139GWh**			
β	Coal-fired	111GWh	1	3	2
	Natural gas-fired	293GWh			
	Oil-fired	13GWh			
	Power generation total	**417GWh**			
γ	Coal-fired	237GWh	3	4	1
	Natural gas-fired	625GWh			
	Oil-fired	27GWh			
	Power generation total	**889GWh**			

* Based on the annual electricity production of the facilities delivered by the Group (as of 2023), a combination of the type (by size as shown in Table 6-9) and number of facilities delivered is estimated.

6.2.4.8 Learning from Simulation

Section 6.2.4 presents a straightforward simulation conducted using aiESG software. The simulation demonstrates how the growth of the WtE Business can help achieve “*net-zero environmental impacts within Planetary boundaries*[46]” in local communities. As a result, it was determined that expanding the WtE Business to a level approaching Level β would significantly reduce the environmental impacts in terms of CO_2, NOx, SO_2, and methane emissions.

The Level β corresponds to the annual power generation of the waste incineration power plants (including overseas facilities) delivered by the Group in FY2023[47]. In other words, the environmental impact reduction contribution of level β can be estimated if the current scale of operations can be realized in a way that meets the assumptions of the current simulation. It can be concluded that in the business strategy up to 2050, if the new type of standardized WtE Facilities are introduced in areas where waste-to-energy (WtE) generation has not yet been introduced, and if the provision of electricity from new WtE generation can be realized at the current business scale, it is possible to expect a reduction in environmental impact in the supply chain equivalent to the goal set out in the vision (except for the environmental impact of mineral usage). In other words, the results suggest that the most effective way to realize the results of environmental impact reduction contributions will be to actively develop the business strategies illustrated in Figure 4-4 in future in areas where open dumping is taking place and where there are no waste incineration and power generation facilities.

On the other hand, the estimates were simulated based on the reduction contribution from the substitution of fossil fuels for electricity, which did not lead to a reduction in the actual environmental impacts within the value chain, and some items were difficult to contribute to the reduction of environmental impacts in this way. For example, the environmental impacts of the “ores usage” of the equipment that makes up the facility cannot be reduced in level β, and ways to reduce it need to be considered. In addition to the promotion of the WtX Business illustrated in Figure 6-1, environmental impact data from the dismantling of facilities will be collected and measures to standardize the facilities and promote material recycling after dismantling of facilities, as indicated in Section 4.4.3, will be considered. In order to reduce the environmental impacts of the “land area utilization”, it is essential to implement measures that will result in a reduction of the actual land use area within the customer’s territory. This can be achieved by rebuilding existing facilities or constructing new facilities in already developed industrial areas.

[46] See note13

[47] The annual power generation of facilities delivered by the Group in FY2023 is equivalent to approximately 59 GWh at facilities in Japan alone, and approximately 400 GWh when overseas facilities are included.

Conclusion

In 2024, we rebranded as the Kanadevia Group, aiming for a future in which the Earth and people live in balance. Kanadevia Group advocates "*Technology for people and planet*," and in addition to the businesses described in this report, we are also engaged in water production and treatment, machinery and infrastructure businesses, and decarbonization businesses. We will leverage the power of technology to harness and support the blessings of nature, while preparing for its threats, striving for balance between people and nature.

The 2024 TNFD report, which covers the WtE Business, enabled us to clarify the relationship between the supply chain and natural capital. From a bird's-eye view of the supply chain, we can confirm that there are significant Physical risks downstream. Furthermore, we anticipate that increased Transition risks will present lucrative business opportunities for the WtE/WtX.

From Figure 6-2, the amount of waste that can be treated in the world in 2050 is expected to be about 3.4 billion tonnes. If this entire amount were to be used for power generation through incineration, the amount of power generated would be equivalent to 2,000 TWh[48], which is about 2,300 times the target γ.

In this report, we propose a worldview called the "***Resilience Eco Society***," which considers the ideal society in 2050 is one that is planetary boundaries, i.e. one in which the environmental impacts is controlled below environmental resilience. In this world, the ultimate cycle in which nothing is wasted is realized. In order to achieve goals and targets based on this worldview, Kanadevia will work in collaboration with not only those involved in waste treatment but also business operators in various fields, and will expand from its plant engineering business for the WtE/WtX to its business of supplying energy (electricity) and recycling resources (materials, chemicals). Furthermore, in our Group's other businesses, such as water production/water treatment, decarbonization business, and machinery/infrastructure business, we will work on innovations to reduce the environmental impact below the level of environmental resilience. Beyond the realization of the "***Resilience Eco Society***" should be the well-being of people. Kanadevia aims to realize the "***Resilience Eco Society***" and a prosperous future "Kanadevia World" with all stakeholders.

[48] Based on the Ministry of the Environment's High-Efficiency Waste-to-Energy Facility Development Manual (Japan, revised March 2018) , calculations are based on waste Hu = 8,800 kJ/kg and an average power generation efficiency of 25%.

Appendix

1. Waste incineration power generation overview

Waste incineration power generation is a facility that burns waste for hygienic treatment and at the same time generates electricity as an energy resource. It consists of equipment mainly made of steel, such as platforms, refuse bunkers and boiler, machinery such as cranes and generators, concrete building foundations and chimneys. Waste collected in refuse pits by refuse collection vehicles is burnt and discharged as ash as it travels over a combustion device called a stoker in the incinerator. The thermal energy produced by combustion is recovered as steam in the boiler and used to generate electricity in a steam turbine generator. The electricity generated is also sent outside the facility.

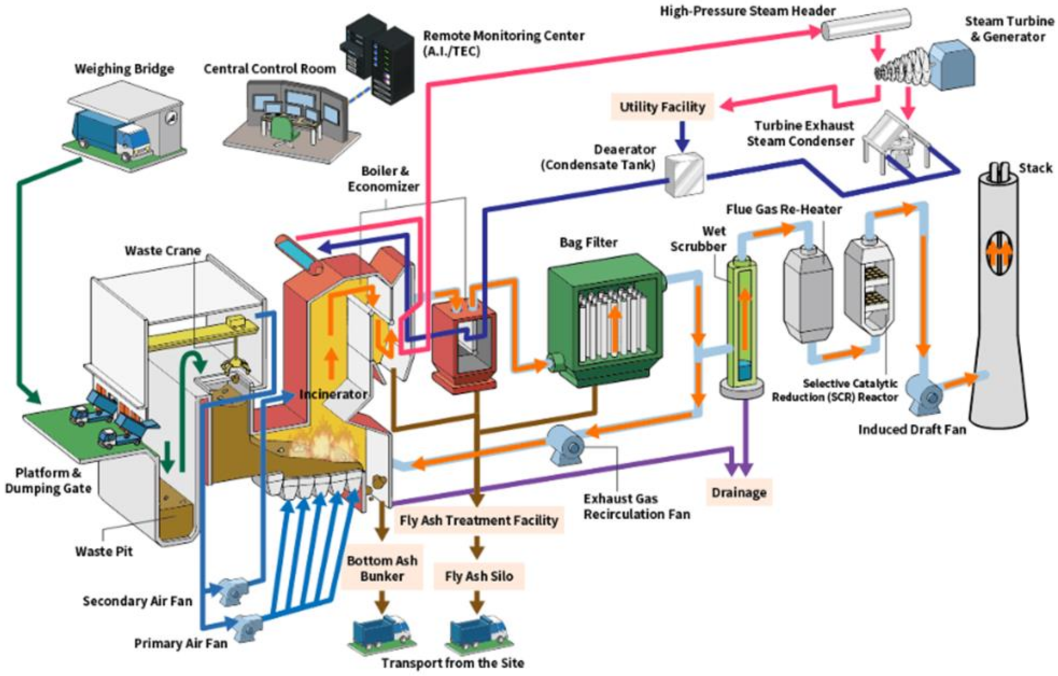


Fig A-1: Schematic diagram of waste incineration power generation

2. Risks and opportunities related to natural capital

2.1 Environmental impacts analysis in procurement using International Input-Output tables

By utilizing Kanadevia Japan and Kanadevia Inova's fiscal 2023 procurement vouchers and the International Input-Output Table for this business, we are able to ascertain the location (country) where the environmental impacts are occurring and the scale of the impacts. The estimation was made using aiESG's database. The estimation is based on the International Input-Output Table and international statistics. Therefore, there may be discrepancies between the estimated figures and the actual situation due to factors such as the resolution and the time and method by which the statistical data was collected.

This data set comprises three graphs, which illustrate ores usage, CO_2 emissions and water footprint of industrial production (Blue). The following are explanations of how each graph should be read:

(1) The world map illustrates the locations of Kanadevia Japan's suppliers in orange and Kanadevia Inova's suppliers in blue, as traced back through the International Input-Output Table.
(2) The center of the circle represents is the country where the load is generated.
(3) The size of the circle represents the size of the load. In many cases, a small orange circle is superimposed on a large blue circle, indicating that Kanadevia Inova's environmental load in that area is greater than Kanadevia Japan's.

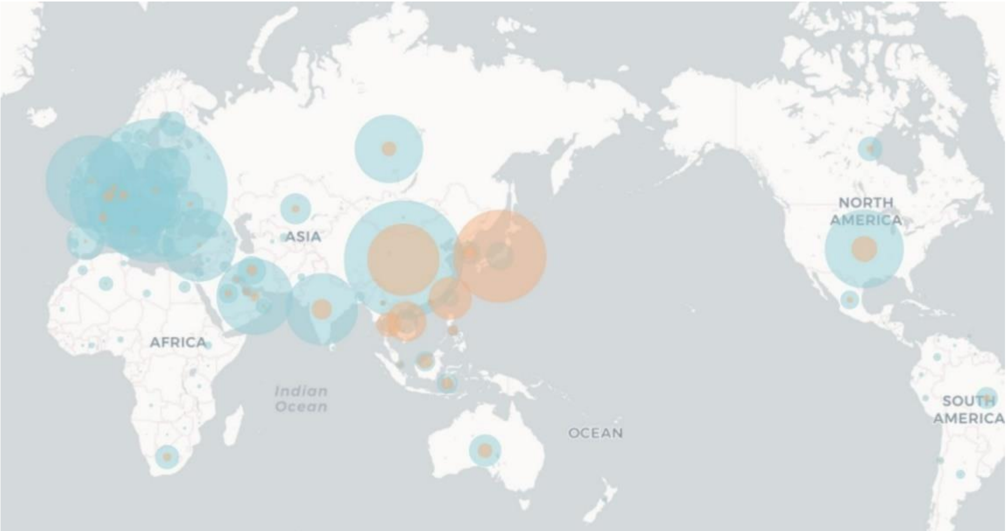
- **Total Ores usage**

Fig A-2 illustrates the total amount of Total Ores usage by country for Kanadevia Japan and Kanadevia Inova at the source of the supply chain. The source countries of the supply chain, Chile (copper mining, etc.), China, Russia, and Poland, used large amounts of ores, and we can see that ores usage was widespread in resource-producing countries and countries around the world where they were processed.

Fig A-2 : Total Ores usage used in the WtE Business supply chain (Kanadevia Japan and Kanadevia Inova)

- **CO_2 emissions**

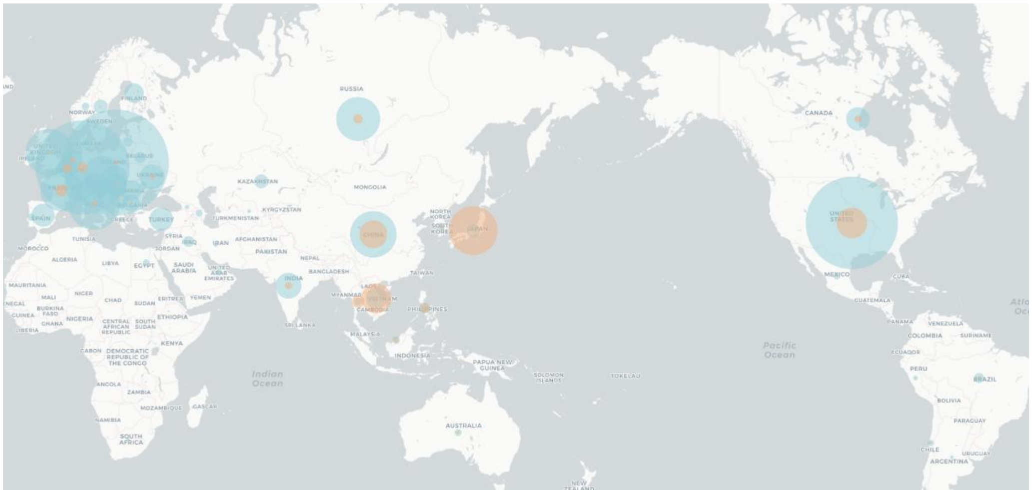
Looking at CO_2 emissions (Fig A-3), it is illustrates that CO_2 emissions are large in countries where factories that procure equipment for plants are located, such as Poland, China, Germany, and Japan. Industries in the supply chain with high CO_2 emissions are the construction industry (Poland, Germany, etc.) and the electronic/steam-related parts industry (Poland, China, Japan, etc.).



<u>Fig A-3 : CO_2 emissions in the supply chain of the WtE Business (Kanadevia Japan and Kanadevia Inova)</u>

- **Water footprint of industrial production - Blue**

Regarding water footprint of industrial production (Blue), we traced the International Input-Output Table and plotted the allocation to the countries where the burdens are placed on the region, and the result was as follows. In terms of countries, the burdens are heavy in Poland, the United States, Germany, China, Italy, and Japan, and in terms of industry, the burdens are heavy in the construction machinery and construction industries.



<u>Fig A-4 : Water footprint of industrial production - Blue in the supply chain of the WtE Business (Kanadevia Japan and Kanadevia Inova)</u>

2.2 Financial impacts of nature-related risks and mitigation measures

Table A-1: Lists of financial impacts and mitigation measures for nature-related risks

Classification refers to ENCORE assessment.

[Nature-related risks upstream in the supply chain]

Iron production (production of iron for use in plants)

Main items of dependencies and impacts	Risk classification	Risk type	Risk overview	Financial impacts	Risk reduction measures
Water resources in the production of iron as raw material for machinery and equipment (water use)	Physical risks	Acute risks	・Production restricted due to inability to procure water. ・Landslides and land subsidence due to excessive water use ・Depletion of water resources.	・Engineering stoppages and loss of sales due to inability to procure steel due to production stoppages ・Penalties to suppliers/contractors	Iron produced through low water use/water reuse, procurement from suppliers
		Chronic risks	・Declining water resources ・Drought due to continuous water scarcity	Continuous suspension of engineering activities due to inability to procure iron, reduced sales	
	Transition risks	Reputation	Criticism of water use by local residents	Residents and NGO response costs and litigation costs	
		Policy	Curtailment or suspension of iron production due to water abstraction restrictions from government	Suspension of production and engineering of machinery and other equipment due to difficulties in procuring iron, and reduced sales	
		Market	Increased preference of local communities and residents for iron produced with less wat	Cost of procuring new iron produced with less water, including reuse	
		Technology	Need to develop technologies for iron that can be produced with less water		
GHG emissions in iron production as raw material for machinery and equipment Physical	Physical risks	Acute risks	—	—	Iron with low GHG emissions in the manufacturing process, procured from suppliers, e.g., by installing additional GHG treatment facilities
		Chronic risks	GHG emissions from steel production, climate change	—	
	Transition risks	Reputation	Criticism of GHG emissions from residents and media	Residents and NGO response costs and litigation costs	
		Policy	Tighter regulations on GHG emissions (e.g., levy, tax increases)	・Investing in the introduction of additional GHG treatment facilities ・Increase in levies and taxes ・Increases in product cost	
		Market	Increased preference of local communities and residents for facilities using steel with low GHG emissions	Ferrous facilities that emit less GHG	
		Technology	Establishment and application of technologies to reduce emissions (low emissions production and emissions absorption)	Investment in the development of technologies to reduce GHG emissions in steel production (e.g., low emissions production, emissions absorption, etc.)	
Solid waste in iron production, a raw material for machinery and equipment	Physical risks	Acute risks	—	—	Procurement from suppliers with low waste emissions/reuse in the steel production process, e.g., through the reuse of waste materials
		Chronic risks	Shutdown due to the depletion of landfills of metals, plastics, and other waste generated by iron production	・Investment in the introduction of additional waste treatment equipment ・Increases in product cost ・Operational constraints due to depletion of final disposal sites	
	Transition risks	Reputation	Criticism of waste from residents and media	Residents and NGO response costs and litigation costs	
		Policy	Stricter regulations and penalties concerning types and quantities of waste	・Investment in the introduction of additional waste treatment equipment ・Increase in Levies and taxes ・Increases in product cost	
		Market	Increased preference of local communities and residents for steel-based equipment with less waste from the manufacturing process	Costs for the procurement of new machinery and equipment using low-waste steel, including for reuse	
		Technology	Establishment and application of manufacturing and reuse technologies that reduce waste in manufacturing processes	Investment in the development of waste reduction (e.g., low-waste production, reuse, etc.) technologies in steel production	

Production of forest products (Biomass power generation)

Main items of dependence and impact	Risk classification	Risk type	Risk overview	Financial impacts	Risk reduction measures
Water resources (groundwater and surface water) used in the production of wood chips, etc., which are used as fuel for biomass power generation	Physical risks	Acute risks	・Water cannot be procured, and production of wood chips is restricted. ・Landslides and land subsidence due to excessive water use ・Depletion of water resource	Suspension of power generation due to inability to procure wood chips, etc. and decrease in sales	Procurement from suppliers that produce wood chips, etc. through the reuse of water and low water use
		Chronic risks	・Reduction of water resources ・On a continuous basis such as wood chips due to water shortages	Continuous suspension of power generation due to inability to procure wood chips and other materials, reduced sales and withdrawal from the business	
	Transition risks	Reputation	Criticism of water use by local residents	Residents and NGO response costs and litigation costs	
		Policy	Suspension of production of wood chips and other products due to restrictions on water abstraction from the government	Decrease in sales due to suspension of power generation due to inability to procure wood chips, etc.	
		Market	Increased preference of local communities and residents for wood chips and other products that can be produced with less water	Costs for procurement of wood chips and other materials produced with less water, including for reuse	
		Technology	Need to develop technologies that enable the production of wood chips and other products using less water	Investment in the development of technologies that enable the production of wood chips and other products with less water, including for reuse	
Use of ecosystems in the production of wood chips, etc., as fuel for biomass power generation (terrestrial)	Physical risks	Acute risks	Deterioration and destruction of surrounding ecosystems due to accidents during production (emission of hot water and pollutants, sediment spills, fire, etc.)	・Additional capital expenditures to mitigate the impact of sediment spills on rare species ・Pollutant removal costs ・Fine	Procurement of wood chips, etc. produced using methods that have little impact on ecosystems, such as the installation of sediment spill facilities
		Chronic risks	—	—	
	Transition risks	Reputation	Criticism of ecosystem destruction from residents and media	Residents and NGO response costs and litigation costs	
		Policy	—	—	
		Market	—	—	
		Technology	—	—	
Pollution of air, soil, etc. by GHG and toxic substances generated in the production of wood chips and other materials used as fuel for biomass power generation (GHG. soil and water pollution)	Physical risks	Acute risks	Pollution caused by breakdowns and accidents in wastewater and exhaust equipment at wood chips and other production plants	・Pollutant removal costs ・Fine ・Court Costs	Procurement from suppliers, e.g., wood chips with low emissions in the production process due to the introduction of additional GHG and pollutant treatment equipment, etc.
		Chronic risks	GHG emissions, climate change	—	
	Transition risks	Reputation	Criticism of GHG emissions and pollution from residents and the media	Residents and NGO response costs and litigation costs	
		Policy	・Strengthening regulations on pollutant emissions ・Levies and taxes on GHG emissions	・Investment in the introduction of additional pollutant treatment equipment ・Increase in levies and taxes ・Rising production costs of wood chips and other materials, rising power generation costs	
		Market	Increased preference of local communities and residents for facilities using wood chips that emit less GHG and pollutants	Investment in the introduction of additional GHG and pollutant treatment equipment in the production of wood chips and other materials	
		Technology	Establishment and application of technologies to reduce GHG and pollutant emissions (production of wood chips and other materials with low emissions and absorption of emissions)	Investment in the development of technologies to reduce GHG and pollutant emissions (e.g., production of wood chips and other products with low emissions, absorption of emissions, etc.)	

[Nature-related risks related to our own portions]

Design and manufacturing (manufacture of machinery, components and equipment)

Main items of dependence and impact	Risk classification	Risk type	Risk overview	Financial impacts	Risk reduction measures
Water resources (water use, surface water, groundwater) in the manufacture of machinery and other equipment for Waste to Energy (WtE) plants	Physical risks	Acute risks	・Water cannot be procured and production is restricted. ・Landslides and land subsidence due to excessive water use ・Depletion of water resource	・Decrease in sales due to stop of production of machinery ・Discontinuation of engineering and incineration facilities due to the inability to procure equipment, and a decrease in sales ・Penalty to the supplier or contractor	・Procurement from iron and suppliers manufactured through the reuse of water and less water ・In the case of in-house manufacturing machinery, the production of machinery by reusing less water and water
		Chronic risks	・Depletion of water resource ・Continued production restrictions due to water shortage	Continuous suspension of engineering activities due to inability to procure equipment, decrease in sales	
	Transition risks	Reputation	Criticism of water use from residents	Residents and NGO response costs and litigation costs	
		Policy	Restriction or cessation of machinery and other manufacturing due to restrictions on water abstraction from the government.	・Decrease in sales due to stop of production of machinery ・Discontinuation of engineering and incineration facilities due to the inability to procure equipment, and a decrease in sales	
		Market	Increased preference of local communities and residents for machines that use less water	Cost for new machinery procurement, which is produced with less water, including reuse	
		Technology	Need to develop technologies that can be manufactured using less water	Invest in developing technologies that can produce products using less water, including reuse	
Pollution of air, soil, etc. due to GHG emissions and hazardous substances generated by the manufacture of machinery and other equipment at Waste to Energy (WtE) plants (GHG, soil and water pollution)	Physical risks	Acute risks	Discharge of pollutants due to accidents or accidents in wastewater and exhaust equipment at manufacturing plants, including machinery expansion	・Pollutant removal costs ・Fine ・Court Costs	Procurement from suppliers and machinery that emits less GHG and pollutants through the introduction of pollutant treatment equipment in the manufacturing process
		Chronic risks	Climate change	—	
	Transition risks	Reputation	Criticism of pollution from residents and media	Residents and NGO response costs and litigation costs	
		Policy	・Strengthening regulations on pollutant emissions ・Levies and taxes on GHG emissions	・Investment in the introduction of additional pollutant treatment equipment ・Increases in product cost	
		Market	Increased preference of local communities and residents for facilities that use less polluting machinery	Investment in additional pollution treatment equipment in machinery manufacturing	
		Technology	Establishment and application of technologies for reducing emissions (construction and absorption of emissions with minimal emissions)	Investment in technological development to reduce pollutant emissions in machinery manufacturing (low-emission manufacturing, emission absorption, etc.)	

[Nature-related risks associated with the downstream (own portion/customer) of the supply chain]

Construction and on-site coordination (infrastructure construction)

Main items of dependence and impact	Risk classification	Risk type	Risk overview	Financial impacts	Risk reduction measures
Water resources (water use) in Waste to Energy (WtE) plants	Physical risks	Acute risks	・Restrictions on Construction Due to Failure to Secure Water Needed for Construction ・Landslides and land subsidence due to excessive water use ・Depletion of water resource	・Construction delays due to construction stops ・Occurrence of a penalty to a supplier or contractor due to a delay in construction	Implementation of construction using a construction method that uses less water and reuses water
		Chronic risks	・Construction shutdown due to the inability to permanently secure water required for production ・Depletion of water resource	Business withdrawal and opportunity loss due to the continual suspension of construction	
	Transition risks	Reputation	Criticism of water use from residents	Residents and NGO response costs and litigation costs	
		Policy	Restraint and suspension of construction due to suppresses on water intake from the government	・Occurrence of a penalty to a supplier or contractor due to a delay in construction ・Business withdrawal and opportunity loss due to the continual suspension of construction ・Additional capital investment in water treatment facilities to reuse used water	
		Market	Increased preference of local communities and residents for facilities constructed with less water	・Selection of construction methods that use less water ・Additional capital investment in water recycling and treatment facilities, etc.	
		Technology	Need to develop technology that allows construction using less water	Investments in less water-intensive construction methods and water treatment technology development	
Use of ecosystems (terrestrial, freshwater, seawater) in the construction of Waste to Energy (WtE) plants	Physical risks	Acute risks	Deterioration and destruction of surrounding ecosystems due to construction and construction accidents (discharge of hot water and pollutants, sediment spills, fire, etc.)	・Additional capital expenditures to mitigate the impact of sediment spills on rare species ・Pollutant removal costs ・Fine	Implementation of construction using construction methods that have little impact on ecosystems that incorporate sediment-spill facilities, etc.
		Chronic risks	—	—	
	Transition risks	Reputation	Criticism of ecosystem destruction from residents and media	Residents and NGO response costs and litigation costs	
		Policy	—	—	
		Market	—	—	
		Technology	—	—	
Air and soil pollution caused by GHG emissions and hazardous substances generated by Waste to Energy (WtE) plants (GHG, air pollution, soil pollution)	Physical risks	Acute risks	Increased emission of pollutants due to accidents in wastewater and exhaust facilities and accidents in construction	・Pollutant removal costs ・Fine ・Court Costs	Construction using methods that incorporate pollutant treatment equipment and have low GHG and pollutant emissions
		Chronic risks	Climate change	—	
	Transition risks	Reputation	Criticism of pollution from residents and media	Residents and NGO response costs and litigation costs	
		Policy	・Strengthening regulations on pollutant emissions ・Levies and taxes on GHG emissions	・Investment in the introduction of additional pollutant treatment equipment ・Increasing manufacturing costs ・	
		Market	Increased preference of local communities and residents for using equipment that emits less pollutants	Investment in the introduction of additional pollutant treatment equipment	
		Technology	Establishment and application of technologies for reducing emissions (construction and absorption of emissions with minimal emissions)	Investment in technological developments to reduce emissions in construction (low-emissions manufacturing, emission capture, etc.)	

Main items of dependence and impact	Risk classification	Risk type	Risk overview	Financial impacts	Risk reduction measures
Solid waste in the construction of Waste to Energy (WtE) plants	Physical risks	Acute risks	—	—	Construction using a construction method that emits less waste, such as by reusing waste
		Chronic risks	To stop construction due to the depletion of landfills of metal, plastic, and other waste generated by construction	・Investment in the introduction of additional waste treatment equipment ・Increase in construction costs Restrictions on operations and lost opportunities due to exhaustion of final disposal sites	
	Transition risks	Reputation	Criticism of waste from residents and media	Residents and NGO response costs and litigation costs	
		Policy	Stricter regulations and penalties concerning types and quantities of waste	・Investment in the introduction of additional waste treatment equipment ・Increase in Levies and taxes ・Increases in product cost	
		Market	Increased preference of local communities and residents for equipment with less waste in construction	Investment in the use of introduction of recycling equipment and reused products to reduce waste	
		Technology	Establishment and application of construction technology with less waste	Investment in the development of waste in construction (construction with less waste, recycle, etc.) for technical development	
Disturbances in the construction of Waste to Energy (WtE) plants (impacts on ecosystems due to light and noise)	Physical risks	Acute risks	Adverse effects of construction noise on breeding and foraging of land and sea animals	・Investment in the introduction of additional silencers to reduce adverse effects	Implementation of construction equipment construction methods with low noise, etc. due to the introduction of silencers, etc. and low impact on nature
		Chronic risks	Continuous adverse effects of construction noise on breeding and foraging of land and sea animals	・Investment in the introduction of additional silencers to reduce adverse effects ・Increase in construction costs	
	Transition risks	Reputation	Criticism of the negative impact of disturbance on the ecosystem from residents and media	Residents and NGO response costs and litigation costs	
		Policy	Stricter regulations and penalties for noise	・Investment in the introduction of additional silencers ・Increase in Levies and taxes ・Costs for changing the location of animals to a distance that does not affect their habitat or nesting	
		Market	Increased preference of local communities and residents for equipment with low noise levels in construction	Investment in the introduction of additional silencers	
		Technology	Establishment and application of operation technology with low noise, etc.	Investment in the development of noise reduction technologies for construction	

[Operation] Waste incineration power generation

Main items of dependence and impact	Risk classification	Risk type	Risk overview	Financial impacts	Risk reduction measures
Water resources (surface water and water use) in the operation of Waste to Energy (WtE) plants	Physical risks	Acute risks	・Reduction in power generation efficiency, curtailment and shutdown of operations due to restrictions on steam production and cooling water use caused by rapid reduction in surface water due to drought, etc. ・Landslides and land subsidence due to excessive water use	Increase in operating expenses due to lower efficiency of incineration and power generation	Introduction of incineration and power generation methods that use less water and reuse water
		Chronic risks	・Lowering of power generation efficiency due to a constant decrease in surface water ・Control and shutdown of operations become normal ・Depletion of water resource	・Continuous operational constraints due to depletion ・Occurrence of penalties due to the inability to operate under assumption	
	Transition risks	Reputation	Criticism of water use from residents	Residents and NGO response costs and litigation costs	
		Policy	Restraint and suspension of operations due to suppresses on water intake from the government	・Operational constraints due to depletion ・Occurrence of a penalty ・Business withdrawal and opportunity loss due to continuous shutdown of operations ・Additional capital investment in water treatment facilities and other facilities to reuse used water	
		Market	Increased preference of local communities and residents for facilities that operate using less water	Additional capital investment in water recycling and treatment facilities, etc.	
		Technology	Need to develop technology that allows operation using less water	Investment in the development of incineration, power generation and water treatment that use less water	
Ecosystem use in the operation of Waste to Energy (WtE) plants (fresh water)	Physical risks	Acute risks	・Destruction and deterioration of freshwater ecosystems due to the mechanism of intake of cooling water from freshwater ・Freshwater ecology due to the discharge of hot water to rivers	・Additional capital investment in equipment to mitigate the impact of water intake	Operations with low impacts on ecosystems, such as the introduction of an intake mechanism that does not collect aquatic organisms through the introduction of additional filters
		Chronic risks	The continued negative impact of incineration and power generation facilities, such as constant discharge of hot water, on the surrounding freshwater ecosystems	—	
	Transition risks	Reputation	Criticism of negative impacts on ecosystems due to disturbance from residents and media	Residents and NGO response costs and litigation costs	
		Policy	—	—	
		Market	—	—	
		Technology	—	—	
GHG emissions from Waste to Energy (WtE) plants and air pollution from hazardous substances (GHG, air pollution)	Physical risks	Acute risks	Air pollution due to increased emissions of pollutants caused by accidents at facilities (such as breakdowns in exhaust treatment equipment)	・Pollutant removal costs ・Fine ・Court costs	GHG with additional treatment facilities and operations with low pollutant emissions
		Chronic risks	Climate change	—	
	Transition risks	Reputation	Criticism of pollutant from residents and media	Residents and NGO response costs and litigation costs	
		Policy	・Strengthening regulations on pollutant emissions ・Levies and taxes on GHG emissions	・Additional GHG or investment in the introduction of pollutant treatment facilities ・Increases in product cost	
		Market	Increased preference of local communities and residents for facilities that emit less GHG and pollutants	Investment in the introduction of additional silencers to reduce adverse effects	
		Technology	Establishment and application of emission reduction (machinery with low emission and emission absorption) technology	Investment in the development of technology to reduce emissions in operations (machinery with low emissions, absorption of emissions, etc.)	

Main items of dependence and impact	Risk classification	Risk type	Risk overview	Financial impacts	Risk reduction measures
Solid waste in the operation of Waste to Energy (WtE) plants	Physical risks	Acute risks	—	—	Operations with less incineration residue and ash/recycled ash due to improved combustion technology, etc.
		Chronic risks	Shutdown due to the exhaustion of final disposal sites for incinerated residue and ash	・Investment in the introduction of additional waste treatment equipment ・Opportunity loss due to control operations by exhaustion of final disposal sites	
	Transition risks	Reputation	Criticism of incineration residue and ash from residents and media	Residents and NGO response costs and litigation costs	
		Policy	Stricter regulations and penalties concerning types and quantities of waste	・Investment in the introduction of additional incineration residue and ash treatment facilities ・Increase in Levies and taxes ・Increases in product cost	
		Market	Increased preference of local communities and residents for equipment with low levels of incineration residue and ash	Investment in the use of recycling equipment to reduce incineration residue and ash, utilization of reusable products, etc.	
		Technology	Establishment and application of management technology with less of incinerated residue and ash	Investment in the development of technology to reduce incineration residue and ash	
Disturbances in the operation of Waste to Energy (WtE) plants (impacts on ecosystems caused by the generation of light and noise)	Physical risks	Acute risks	Adverse effects of operational noise on breeding and foraging of land and sea animals	Investment in the introduction of additional silencers to reduce adverse effects	Operation with a low impact on nature due to the introduction of additional silencers
		Chronic risks	Continuous adverse effects of operational noise on breeding and foraging of land and sea animals	・Investment in the introduction of additional silencers to reduce adverse effects ・Increase in construction costs	
	Transition risks	Reputation	Criticism of negative impacts on ecosystems due to disturbance from residents and media	Residents and NGO response costs and litigation costs	
		Policy	Stricter regulations and penalties for noise	・Investment in the introduction of additional silencers ・Increase in Levies and taxes ・Costs for changing the location of animals to a distance that does not affect their habitat or nesting	
		Market	Increased preference of local communities and residents for equipment with less noise during operation	・Investment in the introduction of additional silencers	
		Technology	Establishment and application of operation technology with low noise, etc.	Investment in the development of noise reduction technologies for construction	

Biomass power generation

Main items of dependence and impact	Risk classification	Risk type	Risk overview	Financial impacts	Risk reduction measures
Dependence on fiber and other materials in biomass power generation	Physical risks	Acute risks	Difficulties in fuel procurement due to cultivation restrictions in fuel growing areas and consequent operational restrictions	・Increase in power generation costs due to increase in fuel procurement costs ・Decrease in sales due to stop	・Securing stable fuel procurement methods and suppliers ・Use of fuel produced in a sustainable manner
		Chronic risks	Suspension of operations or withdrawal from business due to inability to produce biomass fuel feedstock due to climate change or changes in the ecosystem, making it difficult to procure materials	・Opportunity loss due to continuous operational suppress ・Occurrence of penalties due to the inability to operate under assumption	
	Transition risks	Reputation	Shutdown due to NGO criticism of fuel sustainability and use of fossil fuel systems	Residents and NGO response costs and litigation costs	
		Policy	Additional investments (such as costs for switching to sustainable raw materials) will be required to meet stricter standards and regulations regarding fuel sustainability	Additional capital investment to comply with fuel sustainability regulations and to develop equipment that does not use fossil fuels	
		Market	Deterioration in profitability, shutdowns and withdrawals due to rising prices of fossil fuel-based raw materials	Lower earnings due to higher generation costs and shutdowns and withdrawals	
		Technology	Improved need to develop biomass power generation technologies that can significantly reduce (not use) fossil fuel-based feedstock and make better use of organic refuse-based biomass fuels	Investment costs for the development of power generation technologies	
Water resources (water use) in the operation of biomass power generation plants	Physical risks	Acute risks	・Decrease in power generation efficiency due to restrictions on steam production and cooling water use resulting from a sharp decrease in water, and control and shutdown of operations ・Landslides and land subsidence due to excessive water use	Increase in operating costs due to lower power generation efficiency	Introduction of incineration and power generation methods that use less water and reuse water
		Chronic risks	・Lowering of power generation efficiency due to a constant decrease in water ・Control and shutdown of operations become normal ・Depletion of water resource	・Opportunity loss due to continuous operational suppress ・Occurrence of penalties due to the inability to operate under assumption	
	Transition risks	Reputation	Criticism of water use from residents	Residents and NGO response costs and litigation costs	
		Policy	Restriction or cessation of operations due to water abstraction restrictions from government	・Operational constraints due to depletion ・Occurrence of a penalty ・Business withdrawal and opportunity loss due to continuous shutdown of operations ・Additional capital investment in water treatment facilities and other facilities to reuse used water	
		Market	Increased preference of local communities and residents of facilities are operated with less water	Additional capital investment in water recycling and treatment facilities, etc.	
		Technology	Need to develop technology that allow operation using less water	Investment in the development of power generation and water treatment technologies that use less water	

Main items of dependence and impact	Risk classification	Risk type	Risk overview	Financial impacts	Risk reduction measures
GHG emissions and pollution caused by hazardous materials in the operation of biomass power generation plants (GHG, air pollution, water pollution)	Physical risks	Acute risks	Air pollution due to increased emissions of GHG and pollutants caused by accidents at facilities (e.g., failure of exhaust treatment equipment)	・Pollutant removal costs ・Fine ・Court costs	GHG with additional treatment facilities and operations with low pollutant emissions
		Chronic risks	GHG emissions and climate change	—	
	Transition risks	Reputation	Criticism of GHG emissions or pollutant from residents and media	Residents and NGO response costs and litigation costs	
		Policy	・GHG emissions or strengthening regulations on pollutant emissions ・Levies and taxes on GHG emissions	・Additional GHG or investment in the introduction of pollutant treatment facilities ・Increases in product cost	
		Market	Increased preference of local communities and residents for facilities that emit less GHG and pollutants	Additional GHG emissions or investment in the introduction of pollutant treatment facilities	
		Technology	Establishment and application of emission reduction (machinery with low emission and emission absorption) technology	Investment in the development of technology to reduce emissions in operations (machinery with low emissions, absorption of emissions, etc.)	
Solid waste in the operation of biomass power generation facilities	Physical risks	Acute risks	—	—	Operation to reduce and reuse incinerator ash by improving combustion technology
		Chronic risks	Shutdown due to the exhaustion of final disposal sites for ash	・Investment in the introduction of additional waste treatment equipment ・Shutdown and lost opportunities due to exhaustion of final disposal sites	
	Transition risks	Reputation	Criticism of ash from residents and media	Residents and NGO response costs and litigation costs	
		Policy	Stricter regulations and penalties concerning types and quantities of waste	・Investment in the introduction of additional ash treatment facilities ・Increase in Levies and taxes ・Increases in product cost	
		Market	Increased preference of local communities and residents of equipment with low levels of ash	Investment in the use of recycling equipment to reduce ash, utilization of reusable products, etc.	
		Technology	Establishment and application of operation technology with low levels of ash	Investment in the development of technology to reduce ash	

2.3 Nature-related opportunities and financial impacts of the WtE Business

TableA-2：Nature-related opportunities and financial impacts of the WtE Business

Value Chain	Process	Impacts	Opportunities	Financial impacts level	
Procurement	Iron Manufacturing	**GHG emissions*:*** Climate change caused by CO_2 disrupts ecosystem balance	Increasing preference by local government and citizens for facilities with reduced GHG emissions and minimal negative impact on nature	Competitive advantage through leading in GHG emissions reduction	High
Procurement	Production of Forest Products	**Use of terrestrial ecosystems**: Hunting and gathering of organisms on land disrupts ecosystem balance	・Increasing preference by local government and citizens for facilities with minimal negative impact on nature ・Policy support and incentives for facilities with low impact on terrestrial ecosystems (competitive advantage in bidding) ・Enhancing corporate reputation and value through business activities that reduce negative impacts on natural capital and positively affect ecosystems, such as eco-friendly fuel processing and pollution reduction	Opportunities may be created through collaboration with suppliers, high level of difficulty	Medium
Design and manufacturing	Manufacturing of Machinery, Products, and Equipment	**GHG emissions**: Climate change caused by CO_2 disrupts ecosystem balance	Increasing preference by local government and citizens for facilities with reduced GHG emissions and minimal negative impact on nature	Competitive advantage through leading in GHG emissions reduction	High
		Non-GHG air pollutants: Air pollutants disrupt ecosystem balance.	・Increasing preference by local government and citizens for facilities using machinery with low pollutant emissions ・Policy support and incentives for reducing pollutant emissions (competitive advantage in bidding) ・Enhancing corporate reputation and value through business activities that reduce negative impacts on natural capital and positively affect ecosystems, such as pollution reduction	Competitive advantage through leading in non-GHG emissions reduction	High
		Water pollutants: Water pollution disrupts ecosystem balance, making it uninhabitable for living organisms	・Increasing preference by local government and citizens for facilities using machinery with low pollutant emissions ・Policy support and incentives for reducing pollutant emissions (competitive advantage in bidding) ・Enhancing corporate reputation and value through business activities that reduce negative impacts on natural capital and positively affect ecosystems, such as pollution reduction	Opportunities for competitive advantage through expanded water treatment technology application	Medium
		Solid waste: Negative impacts on natural capital through waste	・Increasing preference by local government and citizens for manufacturing with low waste emissions and circular economy practices ・Policy support and incentives for low-waste manufacturing technologies (competitive advantage in bidding). ・Reducing and recovering soil impacts through waste reduction ・Enhancing corporate reputation and value through business activities that reduce negative impacts on natural capital and positively affect ecosystems, such as waste reduction	Competitive advantage through leading in solid waste reduction	High

Value Chain	Process	Impacts	Opportunities	Financial impacts level	
Operation	Waste incineration power generation	**GHG emissions**: Climate change caused by CO_2 disrupts ecosystem balance	Increasing preference by local government and citizens for facilities with reduced GHG emissions and minimal negative impact on nature	Competitive advantage through leading in GHG emissions reduction	High
		Non-GHG air pollutants: Air pollutants disrupt ecosystem balance	・Increasing preference by local government and citizens for facilities with low pollutant emissions ・Policy support and incentives for the quantity and quality of pollutant emissions (competitive advantage in bidding) ・Enhancing corporate reputation and value through business activities that reduce negative impacts on natural capital and positively affect ecosystems, such as low-emission power generation	Competitive advantage through leading in non-GHG emissions reduction.	High
		Solid waste: Negative impacts on natural capital through waste	・Increasing preference by local government and citizens for facility operations with low waste emissions and circular economy practices ・Policy support and incentives for facility operations with low waste emissions (competitive advantage in bidding) ・Gain a competitive advantage and enhance corporate value developing recycling technologies for incineration residues and promoting recycling ・Leading the establishment of waste collection systems that do not generate incineration residues and lobbying local government for regulations ・Reducing and recovering soil impacts through the reduction of incineration residues ・Enhancing corporate reputation and value through business activities that reduce negative impacts on natural capital and positively affect ecosystems, such as waste reduction	Competitive advantage through leading in incineration residue reduction	High
	Biomass power generation	**Textiles and Other Materials**: Impacts on natural capital such as water and soil in the production of textiles and materials	Enhancing competitiveness and corporate value by early response to the demand for renewable energy generation through the development and application of organic waste-based biomass power generation technology	Potential for technological development and market advantage	High
		Non-GHG air pollutants: Air pollutants disrupt ecosystem balance	・Increasing preference by local government and citizens for facilities with low pollutant emissions ・Policy support and incentives for the quantity and quality of pollutant emissions (competitive advantage in bidding) ・Enhancing corporate reputation and value through business activities that reduce negative impacts on natural capital and positively affect ecosystems, such as low-emission power generation.	Competitive advantage through leading in non-GHG emissions reduction	High

Table A-3: Addressing business opportunities

Sales and proposals	• Business expansion due to population growth and industrial development in developing countries • Increasing awareness of the circular economy, especially in developed countries • Strengthening regulations by national and local governments (e.g. promotion of biomass power generation, standardization of waste treatment power generation facilities that combine waste incineration and biogasification, etc.) and strengthening promotion subsidy measures • Proposal of garbage collection rules to collect garbage with less impurities and high efficiency at the beginning of the year • Leading the creation of a system for reducing the environmental burden of waste incineration power generation facilities, etc. through proposals to clients for the creation of proposal requests
Procurement	• Setting internal rules and guidelines for procuring raw materials with low environmental impact • Procurement of raw materials with the lowest environmental impact within the range of specifications presented in the RFP
Design and Development	• Establishing internal rules and guidelines to promote designs with low environmental impact. • Designing based on the use of raw materials with low environmental impact and the reuse of raw materials, etc. • Designing equipment and devices that use natural capital and emit less waste and pollutants during the manufacturing process and facility operation • Developing equipment and devices with long life spans
Construction and on-site coordination	• Adoption of construction methods with low environmental impact, such as using soil protection equipment and soundproofing devices
Operation	• The incineration plant will be fully automated and robotized using AI to (1) properly feed waste into the incinerator, (2) improve the efficiency of combustion and power generation to reduce pollutant emissions, (3) adjust the temperature and air inside the incinerator to reduce incineration residues, and (4) recover resources such as heavy metals from incineration residues. • Recovering heavy metals and other resources from incineration residues • Reducing GHG emissions through biomass power generation • Promoting recycling and resource recovery through waste recycling and other processing • Reusing plastics • Monitoring the surrounding environment (air, soil, water quality)
Maintenance and disposal	• Reducing waste by reusing parts and equipment • Adjustment and demolition with low environmental impact using soil protection equipment

Utilize operation and monitoring results for proposals and development

3. Scope of our business activities based on Planetary boundaries

3.1 Consideration of Planetary boundaries and the scope of our business activities

The Group aims to realize the “Resilience Eco Society”, i.e. a state where the environmental impacts of the countries/regions in which it operates is contained within the environmental resilience of Planetary boundaries. The limits of the environmental impacts of a country/region are set by the government of that country/region through laws and regulations, so the Group must comply with those laws and regulations when conducting business activities. In cases where there are no legal regulations, we will propose environmental standards to be considered in the business activities in question by listing them in the RFP in order to avoid damaging the environmental resilience of the country/region.

By providing products and services that contribute to solving environmental issues, we can encourage others to ensure that their business activities do not damage environmental resilience. Taking such proactive measures can also be said to be our responsibility in the value chain.

Below, we explain (i) the minimum requirements for the Group to comply with in order to avoid damaging environmental resilience, and (ii) proactive measures to minimize the damage caused by others to environmental resilience, in each area of Planetary boundaries.

3.2 Climate Change

In regard to climate change, the objective is to limit the rise in the global average temperature to less than 2°C above pre-industrial revolution levels. Contracting parties to the annex to the United Nations Framework Convention on Climate Change are obligated to implement policies to reduce GHG emissions. The Paris Agreement, adopted at the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change, stipulates climate change measures linked to market mechanisms, and many companies are currently calculating and working to reduce their GHG emissions based on the 1.5°C scenario.

In this sense, achieving targets based on the 1.5°C scenario is the minimum required to avoid undermining environmental resilience in the climate change sector. The Group needs to achieve our goal of reducing GHG emissions by 50% compared to 2013 levels by 2030 and becoming carbon neutral by 2050.

In relation to the WtE Business, as shown in Figure 4-4, Sections 6.2.3 and 6.2.4, if the replacement of fossil fuel-based power generation with waste incineration power generation progresses, it will contribute greatly to reducing GHG emissions. This will stop others from relying on non-renewable energy, and on the other hand, it will increase the number of people who can use energy. It will also reduce the greenhouse gas emissions of others. Therefore, our Group will make proactive proposals in the WtE/WtX Business, as shown in Figure 4-4.

Table A-4-1：Planetary boundaries (Climate Change)

Field	Breaking Point
Climate Change	Limiting the increase in global average temperature to well below 2°C above pre-industrial levels. 2°C increase is considered a threshold that could have significant impacts on the Earth system. The planetary boundary for atmospheric CO_2 concentrations is set at 350 ppm.

3.3 Biosphere Integrity (Biodiversity Loss)

Regarding the integrity of the biosphere (loss of biodiversity), the limit is to keep the species extinction rate below 10 species per million per year. We could not find any internationally common indicators to incorporate into our Group's business activities, such as those in the area of climate change.

However, based on the "Four Principles of Sustainability"[49] that form the basis of *Sustainable Vision* and Materialities setting, our Group will thoroughly manage the environment so that we do not depend on natural resources that are poorly managed by others and so that our business activities do not harm the health of the ecosystem.

The Group will also request that its suppliers comply with the Basic Procurement Policy, actively support its customers in carrying its environmental assessments, and encourage them not to harm the health of the ecosystem.

Table A-4-2: Limits of planetary boundaries (Biosphere Integrity)

Field	Breaking Point
Biosphere Integrity (Biodiversity Loss)	Maintaining ecosystem diversity and preventing species extinction. Global boundaries for genetic diversity change are defined as the maximum extinction rate compatible with preserving the genetic basis of the ecological complexity of the biosphere. Limiting species extinction rates to less than 10 species per million per year.

3.4 Stratospheric ozone depletion

The limit for stratospheric ozone depletion is to limit the decrease in stratospheric ozone to less than 5% of pre-industrial revolution levels. The Vienna Convention for the Protection of the Ozone Layer (1985) and the Montreal Protocol on Substances that Deplete the Ozone Layer (1987) have been adopted, and signatory countries have enacted domestic laws to regulate the manufacture, import and export of ozone-depleting substances and to reduce emissions.

The Group is not engaged in the manufacture or recovery of ozone-depleting substances, such as CFCs and CFC substitutes. Similarly, the Group does not manufacture or recover products that utilize ozone-depleting substances. However, our Group utilize products and equipment that employ ozone-depleting substances. Therefore, we will proactively manage ozone-depleting substances in accordance with applicable laws and regulations,

[49] See note3.

including restrictions on the manufacture, import and export of ozone-depleting substances, as well as emission limitations set by the countries/regions in which we operate. We will actively promote the transition to products and equipment that do not rely on ozone-depleting substances in our business operations.

Table A-4-3：Planetary boundaries (stratospheric ozone depletion)

Field	Breaking Point
Stratospheric ozone depletion	Protect the ozone layer, preventing harmful ultraviolet radiation from reaching Earth. Ozone depletion leads to adverse health effects, including skin cancer, cataracts, and a weakened immune system. Limit the depletion of stratospheric ozone to less than 5% (the boundary of the safe operating area is 276 DU) from pre-industrial levels (290 Dobson Units (DU)). The 5% depletion is considered the threshold above which the ozone layer may not recover.

3.5 Ocean acidification

Regarding ocean acidification, the limit is to maintain the average aragonite saturation of ocean surface waters at 80% or more of the pre-industrial revolution level. In June 2023, the United Nations High Seas Treaty was adopted, which aims to conserve and ensure sustainable use of marine biodiversity in areas beyond national jurisdiction (BBNJ), which account for more than two-thirds of the ocean. This treaty, which aims to introduce internationally legally binding regulations for the conservation of the marine environment, respect for marine ecosystems, pollution prevention, and conservation of marine biodiversity values, has not yet come into force, but if each country ratifies it, it will be linked to the goal of conserving at least 30% of land and marine areas in the Kunming-Montreal Biodiversity Framework of the UN Convention on Biological Diversity, and approximately 30% of the high seas will be protected by 2030.

After the Convention comes into force, we will monitor the status of domestic legislation in each country/region and will manage ocean acidification in accordance with the Convention and domestic laws. Prior to the Convention’s implementation, we will actively promote the management of chemical substances and reduction of plastic waste generation, given that ocean acidification is primarily caused by chemical substance emissions and marine plastics. In the WtE/WtX Business, we will also reduce the generation of marine plastics by strictly separating plastic waste at the source and implementing collection procedures.

Table A-4-4：Planetary boundaries (Ocean Acidification)

Field	Breaking Point
Ocean acidification	Suppress ocean acidification and protect marine ecosystems. Carbonate ion concentration in surface seawater (specifically, the global mean aragonite saturation of the surface ocean (2.75 Ω) relative to aragonite. A decrease in aragonite saturation could lead to the collapse of marine ecosystems. Maintain the mean aragonite saturation of surface ocean waters at 80% or more of pre-industrial levels (3.44 Ω).

3.6 Biogeochemical cycles (nitrogen and phosphorus cycles)

In regard to the nitrogen and phosphorus cycles, the objective is to limit the intervention of human activities in the global nitrogen cycle to 35 million tonnes per year or less for nitrogen and 11 million tonnes per year for phosphorus, compared to pre-industrial revolution levels. Strict standards for water quality are set by domestic law in each country/region. Therefore, our Group will conduct business activities in compliance with laws and regulations related to water quality. When conducting the WtE Business in a country/region where water quality standards are not set by law, we will propose water quality standards to be considered in the business activities in the RFP.

In addition, although it is not the subject of this report, our Group also operates a water treatment business. Water treatment can reduce the excessive discharge of nitrogen and phosphorus contained in wastewater from other parties. Therefore, in our water treatment business, we proactively make proposals to reduce the discharge of nitrogen and phosphorus by other parties.

Table A-4-5: Planetary boundary (nitrogen and phosphorus cycles)

Field	Breaking Point
Biogeochemical cycles (nitrogen and phosphorus cycles)	Limit excess discharges of nitrogen and phosphorus to prevent water pollution and eutrophication. Excessive discharges can upset the balance of ecosystems, causing mass mortality of aquatic organisms and adverse effects on human health. Limit human intervention in the global nitrogen cycle to no more than 35 million tonnes per year for nitrogen and 11 million tonnes per year for phosphorus, compared to pre-industrial levels. (Regional-level boundaries are 62 million tonnes per year of flow from fertilizers to eroded soils to avoid widespread eutrophication of freshwater ecosystems.)

3.7 Land Use Change

In regard to land use change, the limit is to maintain the forest area on earth at least 75%. Regulations on forests vary from country/region to country/region, but for example, in Japan, the Forest Act has been enacted for the purpose of protecting and using forests appropriately, and strict regulations are in place on forest development and use. If our Group’s business activities involve forest development, we will obtain development permission as stipulated by law and plan the scope and extent of development to be the minimum necessary. In addition, depending on the location and extent of development, offset development may be necessary. It is essential to propose the need for offset development to customers not only when the Group engages in forest development activities, but also when a customer's business activities involve forest development.

In addition, in the WtE Business, as illustrated in Figure 4-4, when the maturity level of efforts to address waste issues in the region/society is in the early stages, the volume of landfilled waste can be reduced to 3% of the volume generated by simply introducing a waste incinerator. The volume of waste generated worldwide in 2050 is expected to be enormous. Therefore, by proactively implementing the business proposals shown in Figure 4-4, it will be possible to reduce the amount of waste generated by others and minimize the burden on land use.

Table A-4-6: Planetary boundaries (changes in land use)

Field	Breaking Point
Changes in land use	Decreasing forest area can cause various problems such as accelerated climate change, loss of biodiversity, soil erosion, etc. Maintain at least 75% of the Earth's forest area. The boundary positions of the remaining forest cover compared to the potential area of Holocene forests are 85%, 50%, and 85% for boreal, temperate, and tropical forests, respectively.

3.8 Freshwater Use

The limit for freshwater use is to limit the amount of freshwater used by human activities on a global scale annually to 4,000 km^3 or less. Each country/region has legal standards for water circulation and water quality. For example, in Japan, there is the Basic Act on Water Cycle, which aims to maintain the soundness of the water cycle; the Groundwater Act, which aims to properly use and conserve groundwater; and the Water Pollution Prevention Act, which aims to conserve water quality and regulate wastewater discharge. When using freshwater in our Group's business activities, it is necessary to comply with these laws and regulations.

In addition, as shown in Section 4.3.2.3, when our Group operates a WtE facility, we recycle the water used in the treatment process. Since the amount is dozens of times the amount of water withdrawn, this can be said to be an effort to reduce the amount of water withdrawn for use by others. Furthermore, although it is not the subject of this report, our Group's water treatment business allows us to properly manage the quality of wastewater from others, and our water production business increases the number of people who can use clean water, so we will actively propose these businesses as well.

Table A-4-7: Planetary boundaries (freshwater use)

Field	Breaking Point
Freshwater use	Excessive use can cause various problems such as water shortages, destruction of ecosystems, and conflicts. Limit the annual global freshwater use caused by human activities to 4,000 km^3 or less.

3.9 Atmospheric aerosol load

The limit for atmospheric aerosol load is to minimize global changes caused by human activities by comparing atmospheric aerosol load with pre-industrial revolution levels. Strict standards are set for the regulation of atmospheric aerosol load in each country/region. For example, Japan has the Air Pollution Control Act, and we will comply with these laws and regulations in our business activities. Some aerosols are subject to regulation under the Montreal Protocol on Substances that Deplete the Ozone Layer (1987), and the impact of aerosols on climate change is also being discussed. In the future, if the handling of aerosols is clarified in these treaties and domestic laws are enacted, we will manage them based on that.

In the WtE Facilities that we outsource the operation of, soot and dust are also properly treated at levels below regulated levels or 10 times the regulated levels (see Table 6-1).

Table A-4-8: Planetary boundaries (atmospheric aerosol load)

Field	Breaking Point
Atmospheric aerosol load	Aerosols can have various impacts, including respiratory diseases, climate change, and changes in precipitation patterns. Atmospheric aerosol loading is compared to pre-industrial levels to minimize global changes due to human activities. Aerosol optical thickness is the common control variable. A provisional regional planetary boundary is set at AOD = 0.25 (0.25 to 0.5) because high AOD values in monsoon regions are likely to significantly reduce precipitation and ultimately affect the integrity of the biosphere. Applicability of this regional definition boundary to other locations is under consideration.

3.10 New chemical substances (pollution by chemical substances)

Concerning pollution by chemical substances, the limit is set when 0% of untested synthetic substances are released into the Earth system. As our Group does not develop or manufacture new chemical substances, this does not pose a direct problem, except in special cases where our collaborative researchers develop, manufacture, or use untested synthetic substances and the Group is also involved.

However, as mentioned in the items on ozone depletion, atmospheric aerosol load, and ocean acidification, each country/region has strict regulations on the handling, use, and discharge of existing chemical substances according to the nature of the environmental load and the nature of the chemical substances. Therefore, with regard to pollution by existing chemical substances, we will conduct our business activities in compliance with these laws and regulations.

Table A-4-9: Limits of planetary boundaries (chemical contamination)

Field	Breaking point
New chemical substances (pollution by chemical substances)	Limited to truly new anthropogenic introductions to the Earth System. These include synthetic chemicals and materials (e.g. microplastics, endocrine disruptors, organic pollutants), anthropogenically transferred radioactive materials such as nuclear waste and weapons, human alteration of evolution, genetically modified organisms, and other direct intervention in the evolutionary process. Set at 0% release of untested synthetic materials into the Earth System.

4. Definition of indicators

In order to estimate where environmental impacts occur upstream in the supply chain, we used aiESG's analysis, which utilizes secondary data (Figure 4-1, Section 6.2.4). In the analysis, we checked the environmental impacts using multiple indicators. The definitions of the indicators are shown in Table A-5. aiESG frequently refers to the following definitions in order to conduct its analysis based on government statistics, data compiled by international organizations, and academic papers.

Table A-5: Definition of indicators

Common to all indicators: The value of the indicator is the total value of the environmental impact worldwide, tracing back to the top of the supply chain.

<table>
<tr><th>Indicator</th><th>Description</th></tr>
<tr><td>Ores Usage</td><td rowspan="5">The amount of resource used. See below for the range each resource represents.
Krausmann, Fridolin, et al. "Economy-wide material flow accounting introduction and guide." Institute of Social Ecology: Vienna, Austria (2015).</td></tr>
<tr><td>Biomass usage</td></tr>
<tr><td>Natural gas (usage)</td></tr>
<tr><td>Fossil fuels (amount used)</td></tr>
<tr><td>Building materials (amount used)</td></tr>
<tr><td>Total Water Use – Freshwater</td><td rowspan="6">An indicator of water consumption.
- Industrial water use: The amount of water consumed by industry
- Total water use is the amount of water consumed by all industries

■ Water definition
- Blue water: Surface water and groundwater
- Green water: Rainwater that is stored in the soil or temporarily remains on the soil or vegetation. It eventually evaporates or is transpired through plants.
- Gray water: An indicator of the degree of freshwater pollution. The amount of freshwater required to assimilate polluted water based on natural background concentrations and existing environmental water quality standards.</td></tr>
<tr><td>Industrial Water Use – Freshwater</td></tr>
<tr><td>Total water usage - evapotranspiration</td></tr>
<tr><td>Industrial water usage - evapotranspiration</td></tr>
<tr><td>Total Water Use – Industrial Wastewater</td></tr>
<tr><td>Industrial water consumption – Industrial wastewater</td></tr>
<tr><td>Land area utilization</td><td>The total area of land used to maintain the supply chain.
Land area is the sum of land, inland waters, and coastal waters under a nation's sovereignty. All land outside the exclusive economic zone is included in the land area. (Food and Agriculture Organization of the United Nations: FAO)</td></tr>
<tr><td>Forest land use area</td><td>Forest land is defined as land that is 0.5 hectares or more and is covered by trees. However, this does not include land used primarily for agriculture, urban use, or the maintenance and restoration of environmental functions. Trees are defined as those that are 5 meters or more tall and have a crown coverage of 10 percent or more. For other information, see FAO.</td></tr>
</table>

Indicator	Description
Low wages (labor)	Calculated using risk hours, which is an estimate of how many hours of low-wage work occurred. Low-wage work is defined as the following: - Sector average wage is below the national minimum wage - Sector average wage is below a living wage that allows workers to live a basic life - Sector average wage is below a sweat-free wage (sweat-free wage: a wage that allows workers to work at fair wages and under fair working conditions without suffering from harsh working conditions and low wages)
Child Labor	An estimate of the number of hours of child labor that occurred. Child labor is defined as follows by UNICEF: - For children aged 5-11, this refers to at least 1 hour of economic activity or 21 hours of unpaid household service per week - For children aged 12-14, this refers to at least 14 hours of economic activity or 21 hours of unpaid household service per week - For children aged 15-17, this refers to at least 43 hours of economic activity or domestic work per week
Low wages (labor)	Calculated using risk hours, which is an estimate of how many hours of low-wage work occurred. Low-wage work is defined as the following: - Sector average wage is below the national minimum wage - Sector average wage is below a living wage that allows workers to live a basic life - Sector average wage is below a sweat-free wage (sweat-free wage: a wage that allows workers to work at fair wages and under fair working conditions without suffering from harsh working conditions and low wages)
Overwork	An estimate of how many hours of overwork occurred. Overwork is defined as working more than 48 hours per week.
Risk of indigenous rights being violated across the country	The following factors are used to create a comprehensive numerical value: - Proportion of indigenous people - Status of ratification or support of international treaties (ILO Indigenous and Tribal Peoples Convention (No. 169) of 1989) - Existence of relevant laws

Kanadevia Corporation

https://www.kanadevia.com

Head Office
7-89, NankoKita 1-chome, Suminoe-ku, Osaka 559-8559, Japan
Phone: +81-6-6569-0001 Fax: +81-6-6569-0002

Tokyo Head Office
15th Floor, Omori Bellport D-Wing, 26-3, Minamioi 6-chome,
Shinagawa-ku, Tokyo 140-0013, Japan
Phone: +81-3-6404-0806 Fax: +81-3-6404-0809

Corporate website "Sustainability"
https://www.kanadevia.com/sustainability/