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Article

Agentic AI: Evaluating Value Creation Stories of Individual Companies From a Stakeholder Primacy Perspective

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This research explores an evolutionary AI-driven auditing system for the public interest that connects agentic AI and stakeholder primacy—two emerging discourses rarely bridged in current accounting and auditing research—and integrates insights from sustainability accounting, AI auditing, and regulatory policy, demonstrating how technology can support public-interest assurance. The integrated reports of a Japanese telecommunications company, which aims for carbon neutrality, and a Japanese electric company, which aims for sustainable development for its local communities, are analyzed. The results show that an AI agent helps a practitioner judge sustainability information from a different perspective, provided by another company's integrated report.

KEYWORDS
IFRS integrated reporting framework, Integrated thinking, Stakeholder primacy, Sustainable development, SASB standards, Machine learning

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1 | INTRODUCTION

Since the 2019 Business Roundtable, which aimed to achieve long-term success, the principles of corporate governance have shifted from Shareholder Primacy to Stakeholder Primacy, where corporations exist to serve the interests of all stakeholders – including customers, employees, suppliers, communities, and shareholders (Business Roundtable, 2019). Originally, many Japanese companies had a mission based on Stakeholder primacy. For instance, Itochu, a major Japanese trading company, was founded in 1858 and has been adopting a corporate mission, "Sampo-yoshi" (Japanese for "good for all three sides": good for the seller, good for the buyer, and good for society). Because the Integrated Reporting Framework (IFRS Foundation, 2021b) suits Japanese companies to describe their value creation stories, nearly 1,200 companies in Japan have voluntarily disclosed integrated reports (IFRS Foundation, 2025).

Encouraged by the G7 Finance Ministers and Central Bank Governors Communiqué, IFRS Foundation takes the "Climate first, but not climate only" approach. The International Sustainability Standards Board (ISSB) issued its IFRS Sustainability Disclosure Standards—IFRS S1 General Requirements for Disclosure of Sustainability-related Financial Information and IFRS S2 Climate-related Disclosures—in June 2023. Unlike the International Financial Reporting Standards (IFRS), which companies issuing listed traded share certificates in Japan can adopt as the designated IFRS, they cannot directly adopt IFRS S1 and S2. The Sustainability Standards Board of Japan (SSBJ) was established in July 2022 to develop sustainability disclosure standards applicable in Japan and to contribute to the development of international sustainability disclosure standards. SSBJ Standards, aligning with ISSB standards, were issued on March 5, 2025. The Financial Services Agency is considering requiring disclosure of sustainability information in Securities Reports based on the mandatory SSBJ Standards. In addition to climate-related financial disclosures, ISSB has commenced projects to research disclosures about risks and opportunities associated with biodiversity, ecosystems, ecosystem services, and human capital (IFRS Foundation, 2024b). That is, there are no mandatory disclosure standards for these matters. Some climate actions might destroy biodiversity. In fact, a mega solar power plant is being constructed in Kushiro Wetlands, which is listed under the Convention on Wetlands of International Importance, especially as a Waterfowl Habitat, thereby destroying habitat for rare flora and fauna (The Mainichi, 2025).

Companies independently develop their long-term business strategies to pursue their sustainable growth. Their sustainability activities may have unexpected side effects, such as positive effects on GHG emissions and negative effects on biodiversity or human jobs. The risks of climate change, adaptation, and mitigation differ in nature, timescale, magnitude, and persistence; adaptation risks include maladaptation and negative ancillary impacts. Risks associated with mitigation include potential adverse side effects from large-scale deployment of low-carbon technologies and economic costs. Adaptation is also place- and context-specific; its planning and implementation should be contingent on the local communities' societal values, objectives, and risk perceptions. The latest Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6) recognizes the interdependence of climate, ecosystems, and biodiversity, and human societies; the value of diverse forms of knowledge; and the close linkages between climate change adaptation, mitigation, ecosystem health, human well-being, and sustainable development (IPCC, 2023).

IFRS S1 references the Sustainability Accounting Standards Board (SASB) Standards as a source of guidance that companies are required to consider when identifying sustainability-related risks and opportunities (beyond climate, which is addressed in IFRS S2 Climate-related Disclosures) and determining the information to disclose about those risks and opportunities (IFRS Foundation, 2024b). The IFRS S2 industry-based guidance has been derived from the SASB Standards (IFRS Foundation, 2023a), which specify the percentage renewable metric for 39 industries, including Telecommunication Services, among the total of 68 industries. In other words, IFRS S1 and S2 Standards are

the natural evolution of the SASB Standards (IFRS Foundation, 2023b). The KDDI Group, a major Japanese telecommunications services company, set the net-zero targets for fiscal 2040 by switching to and introducing renewable energy (KDDI, 2024a). The Hokkaido Electric Power Co., Inc. (HEPCO) Group, a Hokkaido-based electric company, aims to meet the high expectations of companies seeking to achieve carbon neutrality by leveraging abundant natural energy resources that offer the greatest potential for renewable energy among regions in Japan (HEPCO, 2024b). In Hokkaido, the northern part of Japan, renewable energy is readily available to data centers. Building large-scale solar power plants in Hokkaido's Kushiro Shitsugen National Park destroys and threatens the local communities, environments, and biodiversity (JAPAN FORWARD, 2025).

In the same way that companies increasingly understand the need to also account for GHG emissions along their value chains and product portfolios to comprehensively manage GHG-related risks and opportunities (GHG Protocol, 2011), company management should also consider indirect effects from their value chains. Stock markets are affected by environmental and social issues in the long-term. The outcomes from the independently developed value-creation stories for sustainable development should be coordinated to avoid unexpected effects from the Stakeholder Primacy perspective. This is because the unexpected effects are difficult for company management to directly consider as material for their financial results. Maladaptation can be avoided through flexible, multi-sectoral, inclusive, and long-term planning and implementation of adaptation actions that yield co-benefits across multiple sectors and systems. Compared to financial statements, numbers are narratively presented in sustainability reports, so both sustainability-related metrics and the validity of the scenarios or hypotheses that support them should be reviewed. Many burdens have been placed on responsible investors who should understand a company's storytelling and the actual impacts expected from its ESG-related business activities, thereby avoiding greenwashing.

This paper analyzes the integrated reports of a Japanese telecommunications company and an electric company using a machine learning approach. The results show that the execution of sustainability strategies by these companies may yield different outcomes, underscoring the need for coordinated metrics in the SASB standards for sustainable development. This study contributes to the literature by presenting an agentic AI scheme to help a practitioner engage in assurance of sustainability information by correcting evidence and identifying risks from the stakeholder perspective.

2 | LITERATURE REVIEW

Several approaches have been employed to assess the performance of companies from a Stakeholder Primacy perspective.

2.1 | Social Costs and Social Returns from an Economic Perspective

Consumption, production, and investment decisions of individuals, households, and firms often affect people not directly involved in the transactions. When these indirect effects are substantial, they can become problematic—what economists refer to as externalities. Externalities are among the main reasons governments intervene in the economic sphere (Helbling, 2010). Most externalities fall into the category of so-called technical externalities; these indirect effects impact the consumption and production opportunities of others, but the price of the product does not account for them. As a result, there are differences between private returns and costs, and the returns and costs to society.

Although an individual or firm's actions may frequently yield favorable private profits, they often harm society. From an economic perspective, externalities are among the main reasons governments intervene in the economic sphere.

In the case of pollution, a polluter makes decisions based only on the direct cost of production and the profit opportunity from production, and does not consider the indirect costs to those harmed by the pollution. The social (total) costs of production are larger than the private costs. Those indirect costs, which are not borne by the producer or user, include decreased quality of life, say in the case of a homeowner near a smokestack; higher health care costs; and forgone production opportunities, for example, when pollution harms activities such as tourism. In short, when externalities are negative, private costs are lower than social costs.

There are also positive externalities, and here the issue is the difference between private and social gains. For example, R&D activities are widely regarded as having positive effects that extend beyond those enjoyed by the producer. A typical example is the company that funds the research. This is because R&D contributes to the general body of knowledge, which in turn supports other discoveries and developments. However, the private returns of a firm selling products based on its own R&D activities typically do not include the returns of others who benefited indirectly. With positive externalities, private returns are smaller than social returns.

When there are differences between private and social costs or private and social returns, the main problem is that market outcomes may not be efficient. To promote inclusive well-being, social returns should be maximized, and social costs minimized. Unless all costs and benefits are internalized by households and firms making buying and production decisions, market outcomes can lead to underproduction or overproduction in terms of a society's overall condition, or "welfare perspective." Consider again the example of pollution. Social costs increase with the level of pollution, which rises as production rises. Consequently, goods with negative externalities are overproduced when only private costs are considered, without accounting for the costs incurred by others. Minimizing social costs would lead to lower production levels. Similarly, from a societal perspective, maximizing private returns over social returns leads to underproduction of goods or services with positive externalities.

The possibility of overcoming inefficiencies caused by externalities through bargaining among affected parties was first discussed in 1960 by Ronald Coase in "The Problem of Social Cost" (Coase, 1960). Coase's theorem about the divergence between the private and social costs of business firms states that the problem would be solved in a completely satisfactory manner when the damaging firm must pay for all damage caused and the pricing system works smoothly. Strictly speaking, this means that the operation of a pricing system incurs no cost. When price represents social cost and excludes externalities, the market addresses inefficiencies from externalities. From an economic perspective, bargaining solutions to be feasible, property rights must be well-defined, bargaining transaction costs must be low, and there must be no uncertainty or asymmetric information when one actor has more information than the other about the transaction. In economics, the price determines the balance between supply and demand. A firm (reporting entity) may sometimes use pricing as a business strategy to compete with its competitors, regardless of the products' and services' fair prices.

From an accounting perspective, some social costs and returns are referred to as private ones, in that they are recognized and measured in a firm's financial statements. Accounting focuses on certain events that have an economic impact on the entity. Those events that are recorded as part of the accounting process are called transactions. Transactions include two types of events: external events and internal events. External events involve the exchange of assets, goods, or services by one party for assets, services, or promises to pay (liabilities) from one or more other parties. Internal events refer to specific occurrences that have a direct and measurable impact on the entity. Examples

include utilizing insurance paid in advance and utilizing buildings and equipment over several years. Even if a firm is not involved in external transactions, an internal transaction still has an economic impact on the firm.

The objective of general-purpose financial reporting is to provide financial information about the reporting entity that is useful to existing and potential investors, lenders, and other creditors in making decisions relating to providing resources to the entity (par. 1.2) (IFRS Foundation, 2018). In economics, the price determines the balance between supply and demand. A firm (reporting entity) may sometimes use pricing as a business strategy to compete with its competitors, regardless of the adequate price of its products and services. Income increases in assets, or decreases in liabilities, that result in increases in equity, other than those relating to contributions from holders of equity claims (par 4.68). Expenses are decreases in assets or increases in liabilities that result in decreases in equity, other than those relating to distributions to holders of equity claims (par. 4.69). Accrual accounting depicts the effects of transactions and other events and circumstances on a reporting entity's economic resources and claims in the periods in which those effects occur (par. 1.17). Whether or not the large-scale solar power plants (Jiji Press, 2025) generate expenses depends on whether there are decreases in assets and increases in liabilities. Whether GHG emissions incur an expense depends on whether there are decreases in assets and increases in liabilities. Depending on approved accounting assets and liabilities and a firm's accounting policy, social costs and returns are recognized and measured as expenses and income, respectively.

2.2 | The Global Reporting Initiative (GRI) and SASB Standards

SASB was founded as a nonprofit organization in 2011 to help businesses and investors develop a common language about the financial impacts of sustainability. The 77 industry-based SASB Standards provide investors with useful, comparable information and are cost-efficient for companies, as evidenced by their adoption by more than 3,500 companies across more than 80 jurisdictions worldwide, including 75% of the S&P Global 1200 Index (IFRS Foundation). When the Value Reporting Foundation consolidated into the IFRS Foundation in August 2022, all active SASB Standards projects were transferred from the SASB Standards Board to the IFRS Foundation. ISSB is considering these projects in its 2024-2026 work plan through its enhancement of the SASB Standards and within its research projects on biodiversity, ecosystems, ecosystem services, and human capital. ISSB builds on and consolidates the work of market-led investor-focused reporting initiatives, including: SASB Standards, TCFD (Task Force for Climate-related Financial Disclosures) Recommendations (TCFD), Integrated Reporting Framework, and CDSB (Climate Disclosure Standards Board) Framework. Especially, ISSB incorporates SASB and TCFD into its standards in a significant way, directly responding to market demand for simplification of the sustainability disclosure landscape. IFRS Sustainability Standards adopt a building blocks Approach (Figure 1), in which ISSB standards are positioned as the sustainability-related financial disclosure from the investor-focused perspective.

Unlike the SASB standards, the GRI standards employ the double materiality approach and support Stakeholder Primacy, positioning sustainability reporting from a broader multi-stakeholder perspective, grounded in investor-focused reporting, as shown in Figure 1. The IFRS building blocks approach prioritizes the ISSB standards over the other standards. When the ISSB adopts a "Climate first, not only climate" policy, the "Climate first, other sustainability matters second" policy is implemented.

GRI, established in 1997, is an independent international organization that helps businesses and other organizations take responsibility for their impacts by providing a common language to communicate them. The aim was to cre-

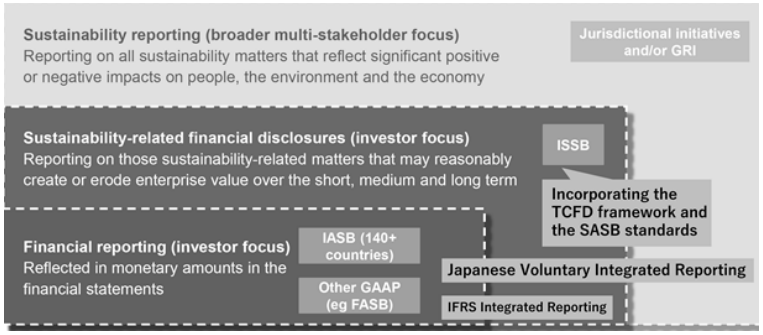


FIGURE 1 IFRS Building Blocks Approach as Global Baseline

ate the first accountability mechanism to ensure companies adhere to responsible environmental conduct principles, which were then broadened to include social, economic, and governance issues. Today, more than 14,000 companies worldwide use GRI for their sustainability reporting. The GRI Standards are a modular system of interconnected standards that deliver an inclusive picture of an organization's material topics, their related impacts, and how they are managed. Universal Standards incorporate reporting on human rights and environmental due diligence, in line with intergovernmental expectations, and apply to all organizations. Sector Standards enable more consistent reporting on sector-specific impacts. Topic Standards list disclosures relevant to a particular topic.

The ISSB and the Global Sustainability Standards Board (GSSB), which develop and approve the GRI Standards, have committed to jointly identifying and aligning common disclosures that address information needs under the distinct scopes and purposes of their respective standards, for both thematic and sector-based standard setting. An initial outcome of the collaboration was announced, involving a methodology pilot that builds on the recently published GRI 101 Biodiversity Topic Standard and the ISSB's upcoming project on Biodiversity, Ecosystems, and Ecosystem Services (GRI, 2024a). GRI and the Taskforce on Nature-related Financial Disclosures (TNFD) have published a joint interoperability mapping resource, providing a detailed overview of the alignment between the TNFD Disclosure Recommendations and metrics, and the GRI Standards (GRI, 2024b).

3 | AGENTIC AI ASSURANCE SYSTEM

3.1 | An AI Agent for Sustainability Information Assurance

An AI agent is a software system built with generative AI that can plan, act, remember, and learn to achieve predefined outcomes autonomously (McKinsey, 2025). This paper extends and applies previous work, an AI agent management framework (Figure 2) for supplementing the human workforce (Tomita, 2019), to an auditor or a practitioner.

An AI agent supplements the human workforce by providing advice to support human decision-making on contracts, acting as a tool under human control. A contract works as a specification for providing advice. Previous work developed a specification-based method to improve design dependability for a system modeled by a deterministic finite state machine (Tomita and Sakamura, 1999). The method generates validation test cases and online error checks from

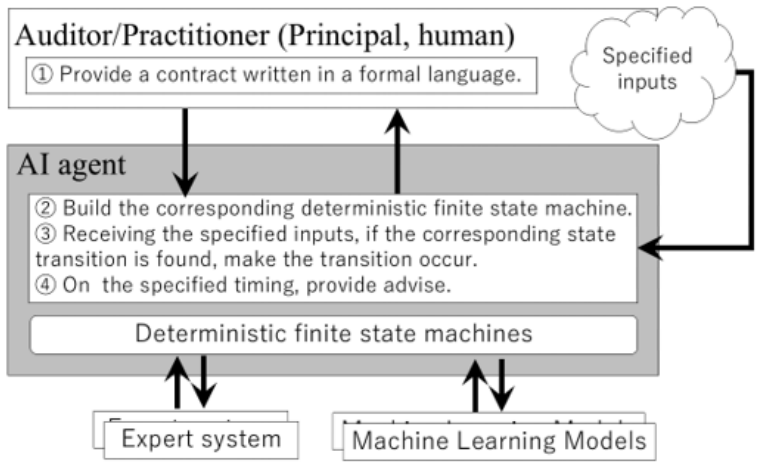


FIGURE 2 AI Agent (Tomita, 2019)

a formalized specification. Since an accounting standard can be viewed as a specification for an economic transaction, our methods are expected to contribute to online assurance. The principal provides a contract written in formal language to its AI agent, which then transforms it into a corresponding deterministic finite-state machine (Figure 2). When the AI agent receives the inputs specified by the contract, it performs the corresponding state transitions. Otherwise, it develops the state machine by asking experts and/or running machine learning models. The AI agent integrates formal expressions, expertise knowledge, and statistical knowledge. The state machine serves as the AI agent's knowledge base. At the specified time, the AI agent provides advice to its principal. The AI agent interacts with the outside world using semantic web ontologies. At the specified time, the AI agent provides the principal with advice on events in which the strategy of an entity under assurance may worsen its sustainability.

3.2 | An AI Agent in the IAASB Assurance Framework

Sustainability information is about sustainability matters. Figure 3 shows the relationship between sustainability matters and sustainability information.

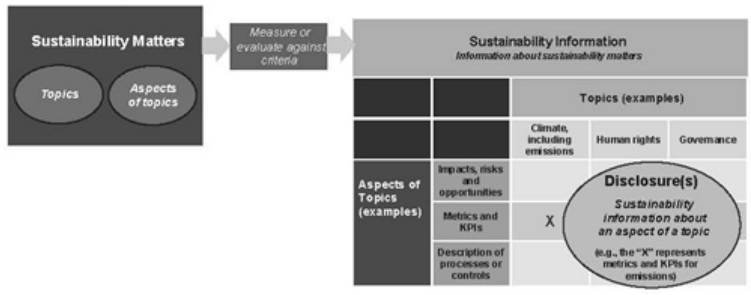


FIGURE 3 The Relationship between Sustainability Matters and Sustainability Information (IAASB, 2024)

Sustainability information is reported in accordance with the criteria. The International Standard on Sustainability Assurance (ISSA) requires the practitioner to evaluate whether the criteria that the practitioner expects a reporting entity to apply in preparing the sustainability information are suitable for the engagement circumstances. In the assurance engagements on sustainability information, the practitioner shall plan and perform the engagement with professional skepticism, recognizing that circumstances may exist that cause the sustainability information to be materially misstated (IAASB, 2024).

In the integrated reporting framework, providers of financial capital are interested in the value an organization creates for itself while they are also interested in the value an organization creates for others when it affects the ability of the organization to create value for itself, or relates to a stated objective of the organization (e.g. an explicit social purpose) that affects their assessments (IFRS Foundation, 2021b). Although sustainability matters are common among investors and other stakeholders, the criteria differ. If the entity lacks sufficient sustainability information especially from the multistakeholder perspective, the corresponding sustainability matter is not adequately managed. For instance, if the entity that prioritizes climate and biodiversity as sustainability issues does not address biodiversity loss along its value chain, it may promote renewable energy while harming biodiversity. The AI agent helps professional judgment by collecting evidence and identifying risks from the shareholder and stakeholder perspectives. In auditing financial statements, an auditor does not have to identify a performance metric for an entity; net profit is a standard metric. In assurance engagements on sustainability information, a practitioner can contribute to sustainability implementation by identifying a more appropriate metric for an entity.

4 | EVALUATION

4.1 | Data

Financial Services Agency (FSA) incorporated sustainability information into its annual statutory securities reports in 2023. Figure 4 shows items to be included in the “Disclosure Section” of Sustainability Information. In the “Disclosure Section” for sustainability information within securities reports, all companies disclose information on “Governance” and “Risk Management.” “Strategy” and “Indicators and Targets” are disclosed when the corresponding sustainability information is deemed material to investor judgment.

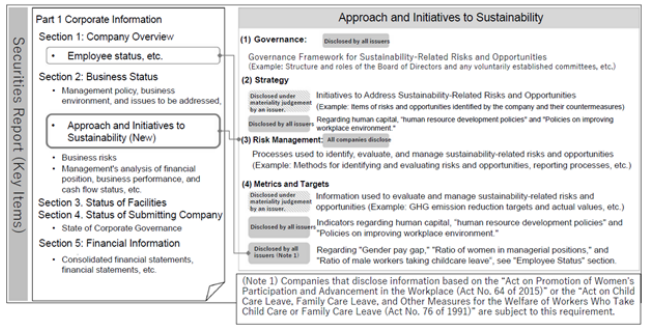


FIGURE 4 Items to be included in the “Disclosure Section” of Sustainability Information

For detailed information, reference to voluntary disclosure documents (such as integrated reports and data books) is also possible. Except in cases where the reference itself could constitute a material misstatement in the securities report, such as when a reference is made to a voluntary disclosure document while knowing it contains a clearly material misstatement, merely false statements in voluntary disclosure documents shall not result in penalties or surcharges under the Financial Instruments and Exchange Act. Even if the forward-looking information described differs from actual results, it shall not immediately incur liability for false statements, etc., provided it is based on reasonable assumptions and has undergone appropriate consideration.

Under the Financial Instruments and Exchange Act, entities required to submit disclosure documents, such as securities reports, must submit them via the Electronic Disclosure Information Processing System (EDINET). The disclosure documents shall be in a format tagged in accordance with XBRL's "taxonomy" (a set of electronic tags) to enhance the secondary usability of disclosure documents for users and improve search functions, among other purposes. The FSA updates the taxonomy annually. The future direction of taxonomy development is under discussion, intending to apply SSBJ standards. It has been confirmed that the taxonomy is developed by incorporating the IFRS Sustainability Disclosure Taxonomy (IFRS Foundation, 2024c) and by developing a unique taxonomy for Japan's disclosure items (Financial System Council Working Group on Disclosure and Assurance of Sustainability Information, 2025). In the same way as the IFRS Sustainability Disclosure Taxonomy, "Governance", "Strategy". "Risk Management" and "Indicators and Targets" elements would be tagged and provided in the text block format. An AI agent is provided with the "Approach and Initiatives to Sustainability" elements of the statutory securities report in the XBRL format and the integrated reports in the voluntary format.

This research draws on the "Approach and Initiatives to Sustainability" section of the KDDI Annual Securities Report (KDDI, 2024b) and on the entire Integrated Sustainability and Financial Report 2024 (KDDI, 2024c). This research also picks up the section of the HEPCO Group Annual Securities Report (HEPCO, 2024a), written in Japanese, and its Integrated Report 2024 (HEPCO, 2024b), written in English. FSA as well as ISSB adopts the "Climate first, but not only climate" policy. The author focuses on descriptions about their climate actions.

4.2 | Model

This paper conducts the k-means text clustering analysis on individual KDDI and HEPCO Group integrated reports and the combined integrated reports using professional version 3.5 of the JCAATs AI Audit Software (Jacksoft). The Silhouette analysis is used to assess the number of clusters. Their integrated reports are converted into tables with lines (KDDI: 4,934 lines; HEPCO Group: 4,912 lines), which are then vectorized using Doc2Vec, with stop words set to symbols, numbers, and NLTK stop words. The combined reports are made by merging the KDDI and HEPCO Group tables. Text clouds are presented to summarize the content of individual clouds, with a 10% TF-IDF threshold, a minimum word count of 3, and exact stop words. In a text cloud, when multiple words share the same TF-IDF score, their font sizes may still differ because rendering depends on factors such as word order and length.

4.3 | Evaluation

Both companies' integrated reports provide detailed and supplemental information about their annual securities reports. Before analyzing the results of the text clustering, the author summarizes the "Approach and Initiatives to Sustainability" sections of their annual securities reports, especially focusing on (2) Strategy, (3) Risk Management and (4) Metrics and Targets in Figure 4.

4.3.1 | KDDI: Approach and Initiatives to Sustainability

Referring to the concerns of long-term investors and other multi-stakeholder groups on one axis and the business impact on the other, KDDI management has mapped out six material issues in the mid-term management strategy. They review information on risks at least twice a year to identify significant risks that seriously affect corporations and discuss measures to detect and reduce such risks and their impacts as much as possible in the event they arise. To achieve their business financial goals, in FY2024, they selected 23 significant risks based on past issues and changes in the business environment. They conducted internal audits focused on risk prediction, risk reduction, and risk approach. They carried out two types of scenario analyses: the less than 1.5°C scenario in which a carbon-free society will be rapidly realized (the increase in the global average temperature is held below 1.5°C above preindustrial levels) in response to the Paris Agreement adopted at COP21, and the 4°C scenario in which physical impact will become apparent due to lack of measures against climate change (the increase in the global average temperature is held at 4°C above pre-industrial levels). Additionally, they identified and evaluated nature-related risks in the value chain. Tables 1 and 2 present the scenario analysis results, and risk analysis results on natural capital, respectively.

Table 1: KDDI scenario analysis results on climate change (KDDI, 2024b)

The less than 1.5° C scenario analysis results			
Analysis of transition risks		**KDDI's risks**	**KDDI's response**
Policies and legal (short- and mid-term strategies)	Carbon tax	Risk of a carbon tax	Promote activities aimed at achieving net-zero emissions in terms of both Scope 1 and 2 CO_2 emissions by the entire KDDI Group by the end of FY2030.
	Tokyo Metropolitan Ordinance/Emission Regulations	Risk of increased costs of buying credits (allowances) for unachieved CO_2 emission Reduction	Purchase of emission credits equivalent to 190,000 t-CO_2 of unachieved CO_2 emissions expected to occur during the Third Plan period from FY21.3 to FY25.3 (CO_2 emission credits generated during the Second Plan period), 40,000 t-CO_2 in FY21.3 period and 150,000 t-CO_2 in January 2023. These emission credits are scheduled to be allocated in the period from FY26.3 to FY27.3, depending on the results of the third plan period from FY21.3 to FY25.3.
Introduction of new technologies to reduce CO_2 emissions and electricity consumption (mid-term strategy)		Risk of increased power consumption of telecommunications equipment due to increased communications volume	Aiming for a sustainable data center that contributes to decarbonization, a 94% reduction in power consumption for server cooling is being researched and developed with Mitsubishi Heavy Industries, Ltd. and NEC Networks & System Integration Corporation using immersion cooling, which uses liquid to cool IT equipment. In addition, a base station sleep function (sleeping during the night when traffic is low) has been introduced to promote the reduction of power consumption. We have developed a function for a millimeter-wave radio model in-house and are accumulating know-how and identifying problems. It is expected to reduce power consumption by approximately 100 kWh per year per radio.
Market and reputation (long-term strategy)		Risk of decrease in subscribers and deterioration in KDDI's corporate value due to delays in initiatives to use more renewable energy and missed targets for achieving carbon neutrality	The Company is switching from fossil fuels to renewable energy sources. It plans to switch the 2.7 billion kWh of electricity consumed in its business operations to renewable energy sources by FY2030. Furthermore, au Renewable Energy, Inc. as a Group company operate additional renewable energy generation projects, such as solar power.
The 4° C scenario analysis results			
Analysis of physical risks (Analysis using RCP 8.5 physical risk scenario)		**KDDI's risks**	**KDDI's response**
Acute	Increase in frequency and severity of disasters caused by abnormal weather (typhoons, flooding, etc.)	Risk of higher costs, such as key personnel for emergency repairs in order to rapidly restore communications networks	Prepare for efficient repair work by revising BCP and conducting disaster recovery drills
Chronic	Rise in average temperature	Risk of increase in amount of electricity used for cooling KDDI's data centers in order to cool servers managed on behalf of customers	Introduce high-efficiency air conditioning systems and switch to renewable energy

Table 2: KDDI risk analysis results on natural capital (KDDI, 2024b)

Target domains	Key items of dependency and impact	Category		Risk factors	Timeline	Size of impact		Impact to finance	Risk-reducing measures
						Scenario I	Scenario III		
Mobile devices	• Impact of terrestrial ecosystem use and to water resources from mining to obtain raw materials (especially metals) for mobile devices • Soil pollutants from the use of toxic substances arising from mobile device production	Physical risks	Acute	• Disaster-prevention features declining due to deforestation from mining • Increased risks of floods and landslides	Short to Medium term	Small	Medium	**Costs increasing:** Supplies of raw materials getting destabilized as suppliers get damage, which will also cause prices to soar	• Procurement of products according to the Act on Promoting Green Procurement • Running sustainable and responsible procurement guidelines • Promoting recycling of used mobile phones
			Chronic	• Decline of water resources from excessive use of water	Medium to long term	Small	Medium	**Costs increasing:** Destabilizing raw material supplies, which also causes prices to soar	• Procurement of products according to the Act on Promoting Green Procurement • Running sustainable and responsible procurement guidelines
		Transition risks	Laws and regulations	• Enhancement of laws and regulations concerning mining and land pollution	Medium to long term	Small	Medium	**Costs increasing:** Laws and regulations getting enhanced causes prices to soar and supplies to decline	• Adjusting sustainable and responsible procurement guidelines in response to laws and regulations
			Reputation	• Criticism and reputation worsen from deforestation, water use, water contamination, etc.	Short to Medium term	Small	Medium	**Sales decreasing:** Sales decreasing as regulation from stakeholders, including customers, worsens	• Engaging key suppliers, including conducting surveys on initiatives such as reducing environmental impact and conserving biodiversity
Stations, Communication cables	• Impact of terrestrial ecosystem especially on land from building stations and installing communication cables • Dependency on stabilizing features of water resources, climate and land to procure raw materials for stations and communication cables	Physical risks	Acute	• Disaster-prevention features declining due to deforestation from mining • Increased risks of floods and landslides	Short to Medium term	Small	Medium	**Costs increasing:** Additional costs incurred to maintain ecosystem Fees arising to recover damaged stations and communication cables	• Designing communication cable routes that are suited to environmental conservation areas • Collaborating with relevant organizations for various initiatives such as implementation of disaster-proof structures and quick support activities for victimized areas • Building stations with considerations to landscape • Promotion of reuse and recycling when facilities are discarded • Considering creating eco-friendly telecommunication areas using Starlink
			Chronic	• Decline of water resources from excessive use of water	Medium to long term	Small	Medium	**Costs increasing:** Destabilizing raw material supplies, which also causes prices to soar	• Reducing water consumption volume, recycling water, and managing effluence in the data center business
		Transition risks	Reputation	• Criticism about views getting lost, and reputation worsening	Short to Medium term	Small	Medium	**Sales decreasing:** Sales decreasing as regulation from stakeholders, including customers, worsens	• Conducting stakeholder engagement activities in the area surrounding business bases • Using construction methods that consider natural scenery

Different from the analysis of the nature-related risks, KDDI does not evaluate the climate-related risks in the value chain. Table 2 shows that KDDI focuses on its procurement sources for raw materials and on the countries in which its businesses operate. As shown in Table3, to accelerate the realization of a carbon-free society, KDDI has set four

environmental targets for the KDDI Group to achieve on the path to net zero emissions by the end of fiscal 2040. They do not set the targets for natural capital.

Table 3: KDDI metrics and targets for sustainability (KDDI, 2024b))

Environmental target	Target fiscal year	Descriptions
(1) Achieve net zero emissions for the KDDI Group	FY2040	Achieve net zero emissions (effectively zero emissions of CO_2) from the entire supply chain, including Scope 3 emissions, in addition to emissions related to the Group business activities (Scope 1 and Scope 2)
(2) Achieve carbon neutrality for the KDDI Group	FY2030	Emissions related to the KDDI Group business activities (Scope 1 and Scope 2)
(3) Minimum ratio of 50% for KDDI's additional renewable energy	FY2030	Achieve a ratio of more than 50% in additional renewable energy for electricity consumed by KDDI.
(4) Switch to 100% renewable energy sources for Telehouse data centers	FY2025	For all Telehouse-brand data centers operated globally by the Group, redefine the target to switch to 100% renewable energy for electricity used, and achieve this goal one year ahead of the conventional target.

Table 3 presents KDDI's sustainability metrics and targets. KDDI assumes that Environmental target (3) is achieved by increasing society's total renewable energy capacity through its installation of new solar power generation equipment or other renewable energy sources (KDDI, 2024b). They do not assume that installing new solar power generation equipment will destroy the environment much sooner than it would without the increasing temperature. When many companies, including KDDI, need to install new solar power generation equipment, they might indirectly harm the environment.

4.3.2 | HEPCO Group: Approach and Initiatives to Sustainability

The basic philosophy of the HEPCO Group's corporate governance is that it cannot develop unless the local community also enjoys sustained development because its market is limited to its local communities, Hokkaido.HEPCO Group systematically identifies risks, including those associated with climate change, formulates and implements countermeasures, and verifies the status of responses under a company-wide integrated risk management framework. For risks with the potential to significantly impact business performance, the Integrated Risk Management Committee, chaired by the President, confirms response policies and status, provides advice, incorporates them into the annual Group management policy, and submits them to the Board of Directors. This ensures efforts to prevent and mitigate risk occurrence within the management control cycle. Based on the "Transition Plan Toward Carbon Neutrality," HEPCO Group is working to meet its GHG emissions reduction targets, which is shown in Table 4.

Table 4: HEPCO metrics and targets for greenhouse gas emission reduction

GHG emissions reduction and contribution targets	Target fiscal year
● Greenhouse Gas Emissions Reduction (Scope 1, 2, and 3) by 46% in comparison to the FY2013 ● Contribution to greenhouse gas reduction: 1.5 million tons	FY2030
● Greenhouse Gas Emissions Reduction (Scope 1, 2, and 3) by 60% in comparison to FY2013 ● Contribution to greenhouse gas reduction: 2.5 million tons	FY2035
● Take up the greatest challenge of achieving carbon neutrality across all energy sources in Hokkaido	FY2050

When examining climate change-related risks and opportunities, not only does HEPCO Group reference the 1.5°C and 4°C scenarios presented respectively by the International Energy Agency (IEA) and Intergovernmental Panel on Climate Change (IPCC), but it also considers Hokkaido's regional characteristics, which are the foundation for HEPCO Group's business. Against the backdrop of Hokkaido's potential as a suitable location for renewable energy businesses, next-generation semiconductor plants, large data centers, and other companies are planning to relocate operations to the region. A significant increase in electricity demand is projected over the medium- and long-term. The entire HEPCO Group assesses the impact of climate change risks and opportunities, shown in Tables 5 and 6.

Table 5: Risks associated with climate change (HEPCO Group, 2024b)

Category	Description of risk	When likely to occur	Degree of impact	Principal measures
Policy & legal	Increase in costs accompanying tighter Laws and regulations targeting CO_2 emissions	Short-term, Medium-term, Long-term	High	● Promote development of renewable energy ● Restart Tomari NPS as soon as possible ● Promote decarbonization of thermal power generation (Utilizing hydrogen, ammonia, CCUS, etc.)
Engineering	Reduction in revenue accompanying decline in utilization of current thermal power due to delays in addressing decarbonization	Short-term, Medium-term, Long-term	Moderate	● Promote decarbonization of thermal power generation (Utilizing hydrogen, ammonia, CCUS, etc.)
	Delay in recouping investments in new technologies	Short-term, Medium-term, Long-term	Moderate	● Identify business risks & assess economic viability
Market	Reduction in revenue due to slowdown in companies moving into the region which is caused by HEPCO's slow decarbonization response and slump in sales of electricity derived from fossil fuels as customers more aware of decarbonization	Short-term, Medium-term, Long-term	Moderate	● Promote development of renewable energy ● Restart Tomari NPS as soon as possible ● Promote decarbonization of thermal power generation (Utilizing hydrogen, ammonia, CCUS, etc.)
	Reduction in revenue as the competitive environment changes due to installation of large amounts of renewable energies	Short-term, Medium-term, Long-term	Moderate	● Expand scope of business domains ● Roll out electrification promotion measures & attract companies to Hokkaido
Reputation	Greater difficulty in procuring financing due to slow decarbonization response	Short-term, Medium-term, Long-term	Moderate	● Promote development of renewable energy ● Restart Tomari NPS as soon as possible ● Promote decarbonization of thermal power generation (Utilizing hydrogen, ammonia, CCUS, etc.)
Acute	Increase in costs for responding to typhoons, snowstorms, and other natural disasters as these become more severe and frequent	Short-term, Medium-term, Long-term	Moderate	● Implement equipment measures based on new insight and previous events ● Recover quickly (training, etc.)
Chronic	Greater cash flow instability due to changes in weather patterns	Short-term, Medium-term, Long-term	High	● Enhance efficiency and optimize operation of hydropower facilities

Table 6: Opportunities associated with climate change (HEPCO Group, 2024b)

Category	Description of opportunity	When likely to occur	Degree of contribution	Principal measures
Resource efficiency/ products & services	Increase in demand for electric power demand through electrification of heating and transportation needs heavily dependent on petroleum-based energy and entry of semiconductor-related industries and data centers leveraging renewable energy potential	Long-term / Medium-term / Short-term	High	• Roll out electrification promotion measures & attract companies to Hokkaido • Respond to customers' needs with supplies of power from renewable energies, etc.
	Increase in revenue by providing customers with solutions that consider their heightened awareness of decarbonization	Long-term / Medium-term / Short-term	Moderate	• Promote energy management business
	Increase in revenue as carbon-free hydrogen is supplied	Long-term / Medium-term / Short-term	High	• Promote hydrogen & ammonia businesses
Energy sources	Increase in sales of electric power accompanying promotion of the use of nuclear power and renewable energies, such as offshore wind, geothermal and biomass power that leverage Hokkaido's potential	Long-term / Medium-term / Short-term	High	• Promote development of renewable energy • Restart Tomari NPS as soon as possible
	Increase in sales of electric power accompanying reduction and decarbonization of thermal power generation achieved through practical application of innovative technologies	Long-term / Medium-term / Short-term	High	• Promote decarbonization of thermal power generation(Utilizing hydrogen, ammonia, CCUS, etc.)
Market	Diversification and stabilization of procurement of financing through green bond issues, etc.	Long-term / Medium-term / Short-term	Moderate	• Diversify and stabilize financing through use of green& transition financing
Resilience	Increase in demand and assurance of the advantages of electricity thanks to enhanced reliability achieved through early recovery	Long-term / Medium-term / Short-term	Moderate	• Implement equipment measures based on new insight and previous events • Recover quickly (training, etc.) • Set up cooperative framework with local governments and communicate information

Hokkaido's characteristics of heavy snowfall, severe cold, and a population dispersed across a wide area mean the region is more dependent upon petroleum-based energy, such as kerosene for heating and gasoline for vehicles that enable people to get around, compared to the rest of Japan—their strategy accounts for the significant potential of promoting the electrification of energy demand. When likely to occur or be realized: long-term (over 10 years); medium-term (approx. 10 years); short-term: approx. 5 years. Degree of impact or contribution, Large: over 10 billion yen/year, moderate: approx. From 1 to several billion yen/year, small: approx. Hundreds of millions of yen/year.

4.3.3 | Text analysis results

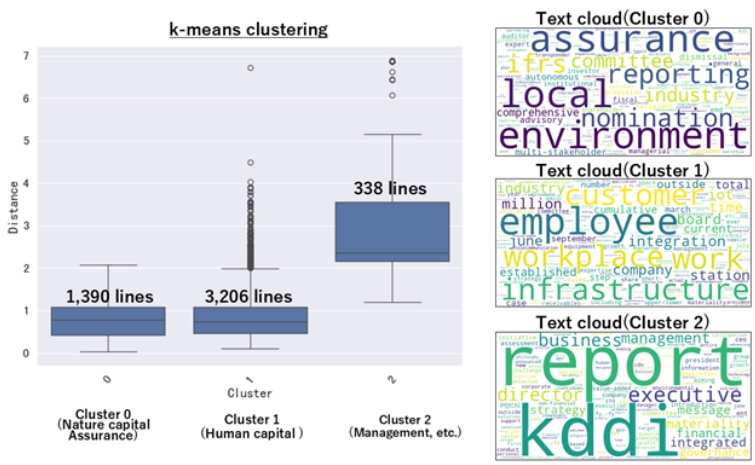


FIGURE 5 Text Analysis of the KDDI 2024 Integrated Report

Figure 5 presents the results of the text analysis of the KDDI 2024 Integrated Report. The KDDI integrated report is evaluated as comprising three clusters: natural capital assurance, human capital, and miscellaneous items, including management. The author names the clusters based on the descriptions of the KDDI's "Approach and Initiatives to Sustainability" section. The KDDI 2024 Integrated Report provides detailed and supplemental information about its annual securities report.

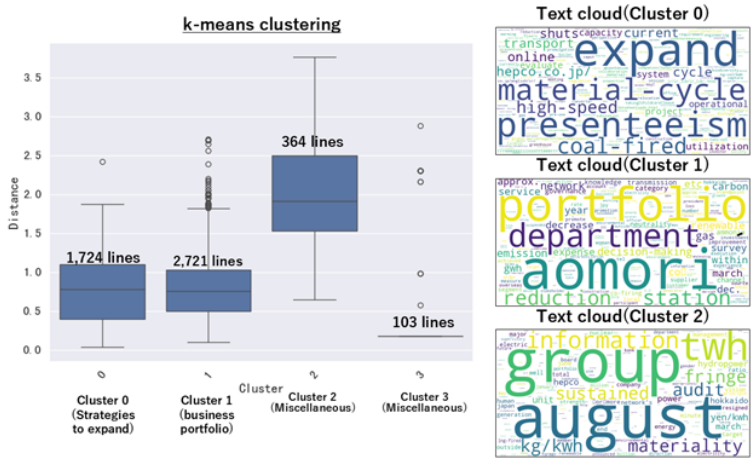


FIGURE 6 Text Analysis of HEPCO Group Integrated Report 2024

As shown in Figure 6, the HEPCO Group integrated report is evaluated as consisting of four parts: strategies to expand, business portfolio, and two miscellaneous. HEPCO identifies its human capital and climate actions material in its annual securities report. Most descriptions of the Integrated Report 2024 focus on their business strategies, including their climate change countermeasures, while their small parts focus on their human capital.

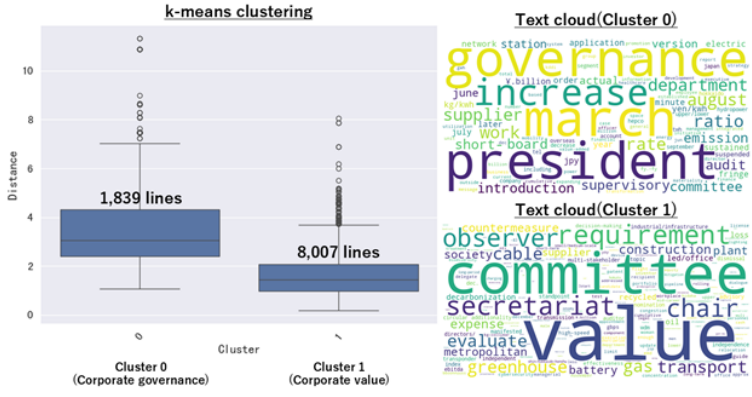


FIGURE 7 Text Analysis of KDDI and HEPCO Group merged 2024 integrated reports

Figure 7 shows that the 2024 integrated report of KDDI and HEPCO Group is evaluated as consisting of two parts:

corporate governance and corporate value.

The text cloud analysis is applied to Cluster 1. Figure 8 presents the TF-IDF scores of words in Cluster 1(Corporate Value).

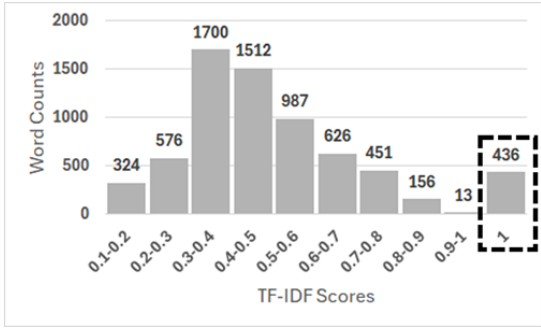


FIGURE 8 TF-IDF scores of words in Cluster 1(Corporate Value)

The 436 words, of which TF-IDF equals 1, are analyzed to determine their TF-IDF scores in the four clusters of the integrated reports: KDDI's two clusters, Cluster 0 (natural capital assurance) and Cluster 1(human capital), and HEPCO Group's two clusters, Cluster 0 (Strategies to expand), and Cluster 1(Business portfolio). Specifically, words are categorized using the following criteria:

• KDDI = 1: A word's TF-IDF score equals one either in KDDI-Cluster 0 or KDDI-Cluster 1.

• HEPCO= 1: A word's TF-IDF score equals one either in HEPCO-Cluster 0 or HEPCO-Cluster 1.

• KDDI < x : A word's TF-IDF score is less than x both in KDDI-Cluster 0 and KDDI-Cluster 1

• HEPCO < x: A word's TF-IDF score is less than x both in HEPCO-Cluster 0 and HEPCO-Cluster 1, but greater than 0.1 both in both in KDDI-Cluster 0 and KDDI-Cluster 1

Table 7 presents the word counts for the categories listed above.

Table 7: Word counts (TF-IDF=1 in KDDI-HEPCO merged integrated reports)

No.	Categories	The number of words
1	KDDI = 1 and HEPCO = 1	50
2	KDDI < 1 and HEPCO < 1	4
3	KDDI = 1 and HEPCO < 0.5	92
4	KDDI < 0.5 and HEPCO = 1	138
5	Others	152
Total		436

The author focuses on Categories 3 and 4, where the TF-IDF score equals 1 in both the KDDI and HEPCO merged in-

tegrated reports, and in either integrated report. Most words represent unique aspects of business. Examples include the terms “mobile”, “IOT”, “automotive”, “municipality”, “congestion”, “hydrogen-ammonia”, “Shin-Hokkaido-Honshu”, “Hokuto”, “regulatory”, “restart”, “shutdown”, and “coal”. These unique words represent how specific strategies are implemented. Category 1 words, which are important to both companies, include “renewable”, “reduction”, and “environment”. As shown in Table 3, KDDI plans to achieve a minimum 50% share of additional renewable energy in its electricity consumption. Au Renewable Energy, KDDI’s subsidiary, has begun operating new solar power plants in the Hokkaido, Tohoku, Kanto, Chubu, Kansai, and Chugoku regions (approximately 38 MW in total, across 135 sites as of July 2024). Unlike HEPCO Group, which, in cooperation with competent government authorities and experts, prevents birds from being electrocuted by Power Transmission & Distribution Equipment, KDDI focuses on biodiversity conservation activities independent of renewable energy generation. An AI agent informs a practitioner of the terms in Categories 3 and 4, and the practitioner then reviews them to identify discrepancies between sustainability matters and a company’s sustainability information, which might omit information that other companies consider relevant.

Regulatory reforms play essential roles for both KDDI and HEPCO businesses. KDDI states that, due to regulatory reforms, the demand for drones in areas such as inspection and surveillance is growing rapidly, and business growth in this sector is remarkable. Regulatory reforms have enabled the use of smartphone signals to operate drones remotely beyond visual line of sight, providing a favorable boost to the business. The restart of Tomari Nuclear Power Station is expected to enable HPECO to expand carbon-free electricity production through the development of offshore wind power and other renewable energy sources. On March 28, 2024 at Tomari Nuclear Power Station (NPS), HEPCO Group started construction of the new seawall, which will serve to counter a tsunami strike. HEPCO conducted a review studying the installation of a seawall. Then, during the February 2024 review meeting with the Nuclear Regulation Authority, the agency will examine compliance with new regulatory requirements. The Japanese government will establish a liaison committee comprising relevant government ministries and agencies to mitigate the adverse impacts of large-scale solar power plants on local environments and ecosystems (Jiji Press, 2025).

4.4 | Limitations

In this paper, just one pair of merged integrated reports is evaluated. Because the number of text clusters is limited, the author could easily exclude miscellaneous clusters which mainly consist of basic company information. A company determines the content of its integrated reports at its discretion. A wider range of merged reports, such as those from companies in the same sector, is expected to be evaluated. Of the 230 (=92+138) words, the third and fourth categories were reviewed to identify discrepancies between sustainability matter and sustainability information. The checking criteria are also expected to be helped by an AI agent.

5 | CONCLUSIONS

A stakeholder-oriented AI auditing approach differs from traditional shareholder-focused financial reporting in terms of scope, judgment criteria, and assurance objectives. The sustainability information is more substantively evaluated, and the judgment criteria, as well as assurance objectives, are also substantive. This research explores an evolutionary AI-driven auditing system for the public interest that connects agentic AI and stakeholder primacy—two emerging

discourses rarely bridged in current accounting and auditing research—and integrates insights from sustainability accounting, AI auditing, and regulatory policy, demonstrating how technology can support public-interest assurance. This paper analyzes the integrated reports of a Japanese telecommunications company, which aims to achieve carbon neutrality to promote global environmental protection, and of a Japanese electric company that provides electricity to the telecommunications company, generated by renewable energy, sometimes at the expense of local environments. The results show that the execution of sustainability strategies by these companies may yield different outcomes, highlighting the need for complementary approaches when applying the SASB standards, which encourage companies to adopt renewable energy sources for sustainable development. AI agents can help humans understand the broader implications of individual companies' value creation stories for society's sustainable growth. The analysis was conducted using off-the-shelf AI audit software (Jacksoft) that integrates various data types, generates a Python script to automatically execute commands, and interoperates with other software. This research demonstrates that an agentic AI scheme is ready to be an applicable and implementable approach to sustainability assurance.

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