



# ESG Value Accounting Report for Chinese Listed Companies

# 2023

Compiled by China Association for Public Companies  
Supported by GoldenBee (Beijing) Management Consulting Co.,Ltd.

ESG Value Accounting Report for  
Chinese Listed Companies  
(2023)

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Approved by the State Council, China Association for Public Companies (CAPCO) is a national self-regulatory organization and a non-profit organization incorporated by publicly listed companies and relevant entities. The aim is to facilitate standardized regulation of the capital markets and preserve the lawful rights and interests of the members. CAPCO operates under the oversight of China Securities Regulatory Commission (CSRC).

CAPCO performs its functions under the guidelines of "Service, Self-regulation, Compliance and Enhancement". CAPCO provides a platform of high-level services for its members. It is committed to improving the quality of listed companies and promoting sound corporate governance and culture, so as to facilitating the quality improvement of the entire capital market.

CAPCO's governance structure is composed of the Assembly of Members' Representatives, the Board of Directors and the Supervisory Board, all of which function based on membership representation. CAPCO is committed to building itself into an organization that voices the development requests of its members, protects the members' interests, and provides quality services. CAPCO is also dedicated to communicating regulatory and self-regulatory requirements to its members in order to make the capital markets more sophisticated.

GoldenBee Management Consulting Co., Ltd. (GoldenBee Consulting for short), founded in 2003, is one of the first professional organizations to embrace social responsibility and sustainable development/ESG in China. We strive to develop a close partnership with sustainability-oriented enterprises and organizations and serve as a high end think tank for them. GoldenBee Consulting is a member of CAPCO's Sustainability/ESG Committee.

Committed to the philosophy of "responsible competitiveness for sustainable development", GoldenBee Consulting pioneers consulting, research, training and sustainable branding services in social responsibility and sustainability/ESG in China. Upholding the corporate spirit of "respect, enterprising, efficient, passionate and independent", the company established the strategic goal of being a high-end thinktank that strives to develop a close sustainability-focused partnership with enterprises and organizations and dedicates itself to growing into a Chinese thinktank that contributes to the global sustainable development.

Since 2009, the company has established the GoldenBee Social Responsibility Report Database to assess the quality of social responsibility/ESG/sustainability reports released in China and publish research results every year in our *Blue Book of GoldenBee Research on CSR Reporting in China*. In 2012, we started to conduct research on the monetization of social responsibility. In 2017, we released the quantitative research results of the social responsibility value of the responsible competitiveness projects. Besides, we continue to deepen our research of natural capital accounting and multi-capitals accounting, and innovatively provide services for enterprises in this aspect. In 2021, we created the OneESG platform, pioneering the method of monetizing ESG factors. Based on our 20 years of social responsibility/ESG professional experience, we empower data quality management and have proposed net ESG value, ESG risk/opportunity value, ESG price-earnings ratio, comprehensive price-earnings ratio and other indicators. Accordingly, we have carried out ESG value accounting for all A-share listed companies and Hong Kong-listed mainland companies since 2017, and developed ESG portfolio analysis tools.

Official website of GoldenBee Consulting: <https://goldenbeechina.com>

The OneESG platform: <https://oneesg.cn>

The report to the 20th National Congress of the Communist Party of China has clearly defined the scientific connotation of Chinese-style modernization, which leads the way forward for companies to boost high-quality development in the new era. ESG (Environmental, Social and Governance), as a framework that measures sustainability performance of companies from environmental, social, and governance aspects, is highly consistent with Chinese-style modernization, including the modernization of common prosperity for all, of material and cultural-ethical advancement, of harmony between humanity and nature, and of peaceful development, which makes ESG an important approach for companies to contribute to Chinese-style modernization. Now, with a stronger presence in mainstream investment philosophy and strategy worldwide, ESG has been used to assess the target company's risk resilience and long-term return potential, providing new opportunities for listed companies to enhance their valuation and reduce risks.

ESG rating data, which can evaluate the company's management of sustainability factors related to its valuation, financial performance, and investor return, and predict the long-term return trend of investment, are a key channel for investors to learn ESG performance of listed companies. However, the data's inability to directly demonstrate the external impacts of a company on the environment and society makes it difficult to evaluate the company's performance in promoting sustainable social transformation. This has, therefore, spawned related researches on evaluating the external impacts of a company on the environment and society.

This report, which aims to explore a new path for ESG evaluation of listed companies in China, was led by the China Association for Public Companies (CAPCO) and technically supported by GoldenBee Consulting, member of CAPCO's Sustainability/ESG Committee. Based on the monetized accounting of ESG value, GoldenBee Consulting proposes a series of new indicators for measuring the ESG value of listed companies, such as net ESG value, ESG risk/opportunity value, and ESG price-earnings ratio. Using Chinese listed companies as samples, GoldenBee Consulting conducts monetized accounting of ESG value and explores the application of ESG value accounting results in ESG investing.

ESG value accounting reflects the net impact of companies on the environment and society and their further impact on the future financial performance and valuation by monetizing the external impact of companies on the environment and society. Taking A-share listed companies as samples, this report conducts ESG value accounting research on the companies from 2018 to 2022 via GoldenBee Consulting's ESG monetized accounting platform based on publicly disclosed ESG related reports, annual financial reports, and other information, and concludes the following findings: Overall, the number of listed companies that generate positive net ESG impact has been increasing year by year. In terms of environmental value, the emissions and resource utilization intensity of companies per 10,000 yuan of operating revenue show a downward trend, indicating significant improvement in environmental performance. In terms of social value, more than half of the companies generate positive social value for stakeholders. In addition, compared to the industry average net ESG value, it has been found that more than half of the listed companies embrace ESG opportunity value.

The report also explores the application scenarios of ESG value accounting results in investment. Firstly, investors can refer to ESG value data for the construction and adjustment of investment portfolio. The ESG Value Enhanced Index is benchmarked to the CSI 300 Main Index (000300.SH), and constructed by using Net ESG Value Per Share and ESG Risk/Opportunity Value Per Share as stock selection factors respectively. Backtesting from January 2018 to July 2023 shows that both Net ESG Value Index and ESG Risk/Opportunity Value Index have positive cumulative abnormal return (CAR) relative to the CSI 300 Main Index during the sampling period, showing that ESG value accounting data are indicative of index investment. Secondly, the monetized ESG value data can be better combined with corporate valuation models to construct a unique valuation system with Chinese characteristics. Taking the discounted cash flow model as an example, in the numerator part, combining ESG risk/opportunity value with the company's future cash flow into company valuation can accommodate the impact of sustainability factors on corporate cash flow and better reflect the company's fundamental situation; in the denominator part, combining net ESG value with expected return rate can holistically reflect market confidence in companies and expected return of investors.

The ESG value accounting and research conducted by this report are in line with the latest development trends in ESG evaluation at home and abroad. In the future, as the carbon peaking and carbon neutrality strategy deepens and the ecosystem of sustainable financial policy gradually improves, the ESG value accounting system will become more mature. As an innovative ESG evaluation method, ESG value accounting system helps establish a benchmark for sustainable finance innovation and development in China, and drives sustainable finance development worldwide.

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**1. ESG Value Accounting:  
A New Approach to Corporate ESG  
Assessment Development**

During the Annual Conference of Financial Street Forum 2022 in November 2022, Yi Huiman, Chairman of the China Securities Regulatory Commission (CSRC), proposed to "thoroughly study the applicable scenarios of mature market valuation theories, grasp the valuation logic of different types of listed companies, explore the establishment of a valuation system with Chinese characteristics, and promote the function of the market's resource allocation." The establishment of a valuation system with Chinese characteristics needs to be in line with China's national conditions, and factors, such as market mechanisms, industrial structure, and sustainability capabilities, should be comprehensively and fully considered. It should establish a valuation system that aligns with the characteristics of China's capital market, which is transitioning and emerging, in order to better play the benchmarking and guiding role of the capital market as the "price anchoring.", promote value discovery in the capital market, facilitate the allocation of resources, and become a pillar for the capital market to better serve the real economy.

ESG (Environmental, Social, and Governance) is a sustainable development perspective that focuses on a company's environmental impact, social responsibility, and corporate governance. It reflects the company's ability to consider environmental factors, prioritize employee and social welfare, and establish transparent governance structures in business decisions. It presents the company's sustainability and its contributions to society and the environment to stakeholders. Currently, ESG investing is gradually becoming a prevalent investment philosophy and strategy on a global scale, with ESG indicators becoming one of the important decision-making tools for investors in the stock market. ESG performance of listed companies can potentially impact their financial performance, which will further affect its stock valuation. Investors incorporate ESG factors into their decision-making process to assess the target's risk resilience and long-term return potential. In ESG investing, investors pay increasing attention to the governance level of invested companies and the risks associated with violations of national environmental and social governance policies, as well as the value created by companies for initiatives such as "rural vitalization" and the 30·60 decarbonization strategy

Promoting ESG practices has become a focal point for companies in China. As the world's second-largest economy, China has also been actively committed to advancing ESG practices in recent years. In 2018, the China Securities Regulatory Commission (CSRC) revised the *Code of Corporate Governance for Listed Companies*, emphasizing the requirement for listed companies to disclose information related to the environment, social responsibility, and corporate governance. In December 2020, the Central Commission for Comprehensively Deepening Reform approved the *Plan for the Reform of the Legal Disclosure System of Environmental Information*, with the goal of establishing a legal disclosure system of environmental information by 2025. In 2022, the State-owned Assets Supervision and Administration Commission of the State Council (SASAC) published the *Work Plan for Improving the Quality of Listed Central SOEs* which urged central SOEs' to take lead in the capital market to develop ESG management system and enhance ESG performance, striving for full ESG report disclosure coverage among all listed central SOEs by 2023. With the issuance of ESG disclosure regulations by the CSRC, stock exchanges, Ministry of Ecology and Environment (MEE), and the SASAC, the significance of ESG reporting has been progressively elevated.

With the increasing consensus on sustainable development among all sectors of society, the demands placed on companies in areas such as green development, energy conservation, emission reduction, social responsibility, integrity in business, and compliance management have become more diverse and stringent. Currently, ESG assessments of companies are often presented in a rating format, which may not specifically reflect the external value contributed by the company to the environment and society,

nor the external costs incurred. It cannot fully measure the risks and opportunities faced by the company. In order to better meet the needs of investors, international organizations such as the International Sustainability Standards Board (ISSB), the Task Force on Climate-related Financial Disclosures (TCFD), and S&P (Standard & Poor's), among others, have conducted research on ESG value accounting. Domestic institutions have also conducted evaluations and research attempts related to social value. As early as 2008, the Shanghai Stock Exchange proposed the concept of "Social Contribution Value Per Share (Scvps)" as a quantified indicator of external value accounting, for investors. ESG value accounting provides new insights and directions for ESG assessments of companies.

## 1.1 The Global Trend of ESG Value Accounting

Several international organizations have conducted research on ESG value accounting, focusing on quantifying the social and environmental impacts of corporate activities and monetizing the externalities. The Natural Capital Coalition<sup>1</sup> has developed the methodology of Natural Capital Protocol based on approaches such as *Corporate Ecosystem Services Review* and *Guide to Corporate Ecosystem Valuation*. It provides an internationally standardized framework for the identification, measurement, and valuation of risks and opportunities of corporate operations, legal and regulatory compliance, financing, reputation, marketing, and social relations. Accordingly, it analyzes businesses' impacts and dependencies on natural capital, further assesses the positive or negative value of natural capital<sup>2</sup> generated by their activities. This enables the management of adverse impacts on natural capital and inform corporate decisions.

Social & Human Capital Coalition, in collaboration with over 50 forward-thinking companies and more than 250 public consulting organizations, has jointly researched and proposed the methodology of *Social & Human Capital Protocol*. This methodology provides a reliable, comparable, and widely accepted approach to assessing the impacts of social and human capital. It offers a universally accepted framework for companies to measure and value social and human capital, enabling them to better assess social and human risks and opportunities.

The accounting firm, KPMG, has proposed the True Value methodology<sup>3</sup>, which fully considers the positive and negative externalities of companies in the economic, social, and environmental aspects when assessing their true earnings. By quantifying contributions through monetary valuation, the model combines accounting profits with contributions in the economic, social, and environmental dimensions to determine the true value of a company. By measuring true value, companies can employ strategies such as increasing investment opportunities, reducing risks, enhancing positive externalities, and minimizing negative externalities to further create value for both the company and society.

On June 26, 2023, the International Sustainability Standards Board (ISSB) officially released its first set of global sustainability disclosure standards ("ISSB Standards" for short), including the *IFRS S1 General Requirements for Disclosure of Sustainability-related Financial Information* (IFRS S1) and

1 The Natural Capital Coalition and the Social & Human Capital Coalition united to become the Capitals Coalition in 2019.(Capitals Coalition.org.)

2 The capital provided by renewable and non-renewable natural resources that brings benefits or services to people.

3 KPMG.A New Vision of Value: Connecting corporate and societal value. creation.2014.p.39-55.<https://assets.kpmg.com/content/dam/kpmg/pdf/2014/10/a-new-vision-of-value-v1.pdf>.

the *IFRS S2 Climate-related Disclosures* (IFRS S2). The ISSB is actively working towards integrating sustainability-related financial information with financial statements, aiming to make them an integral part of general financial reporting. This integration will assist investors, lenders, and other creditors in evaluating a company's prospects.

Academic and research institutions have also made efforts in ESG value accounting. Harvard Business School, for example, has developed an assessment framework for the operational and product/service impacts of companies. They proposed the methodology of Impact-Weighted Accounts<sup>1</sup> (IWA), which aims to quantify the impact of a company's activities on stakeholders and the environment. By converting the ESG impact into monetary values, the IWA integrates this information into the company's integrated profit and loss statement (IP&L) and financial data. This approach reflects the overall value created by the company for shareholders and all other stakeholders. It provides a basis for investors and asset managers to assess company value and make investment and financing decisions.

S&P introduced the methodology called "Trucost"<sup>2</sup> that provides standardized environmental data for over 15,000 companies. It analyzes challenges related to climate change, water use, waste management, and overexploitation of natural resources. By assessing impacts, identifying risk exposures, and managing risks and opportunities, it helps companies effectively address these issues. True Price<sup>3</sup> has proposed the methodology of "True Pricing". Based on objective and standardized assessment models, it monetizes the external impacts of supply chains, such as climate change, water pollution, and occupational accidents by using tested impact measurement and assessment methods. Then, it calculates the true cost of products and aggregates market prices with the true costs to form comparable true prices. This approach allows consumers to see and voluntarily pay the true price of the products they purchase, making sustainable products and services affordable for all. In addition, some institutions are exploring the integration of ESG into investment valuation models by combining methods of TCFD or The Taskforce on Nature-related Financial Disclosures (TNFD), with income approach, market approach, and asset-based approach.

Several companies have put sustainable value-related research methods into practice by monetizing ESG measurements to assess the impacts of their business activities. For example, Samsung has utilized the True Value method of KPMG since 2016 to quantitatively measure the positive and negative impacts of its sustainability activities by monetizing a set of indicators related to economic value, social value and environmental value<sup>4</sup>. BASF, in collaboration with PwC Germany and PwC U.K. (PwC), developed the "Value to Society" method in 2013. It standardizes the monetary valuation of the company's business activities at corporate level, for business units, for projects and strategic decisions and at product level. This valuation includes economic indicators (such as profits, amortization, and depreciation), environmental indicators (such as GHG emissions, waste, and resource utilization), and social indicators (such as human capital as well as health and safety). The methodology aims to measure BASF's contribution to a sustainable future, compare the materiality of these financial and non-financial impacts of business activities, and provide a better understanding of their interdependencies along the value chain<sup>5</sup>.

1 Serafeim G, Zochowski T. R and Downing J. Impact-Weighted Financial Accounts: The Missing Piece for an Impact Economy. Harvard Business School. 2020.

2 <https://www.spglobal.com/esg/trucost>.

3 <https://trueprice.org>.

4 Samsung. Samsung Electronic Sustainability Report. 2023.

5 BASF. Value-to-Society: Measurement and Monetary Valuation of BASF's Impacts in Society. 2018.

Across the globe, the dimensions of assessing the financial value of sustainability impacts have gradually expanded from climate change-related financial information and nature-related financial information to sustainability-related financial information. More and more companies are engaging in ESG value accounting practices. The valuation of ESG value is gradually presenting a trend towards exploring how to deeply incorporating an ESG lens into business valuations and financialize the process.

## 1.2 China<sup>1</sup> Endeavors in ESG Value Accounting

Domestic organizations have undertaken evaluations and research attempts related to social value. In 2008, the Shanghai Stock Exchange issued the *Notice on Strengthening the Social Responsibility of Listed Companies and Issuing the Guidelines for Environmental Information Disclosure of Listed Companies on the Shanghai Stock Exchange*, which encouraged listed companies to disclose the "Social Contribution Value Per Share (Scvps)." This value is composed of two parts: basic earnings per share and the value-added per share, combining financial performance and ESG performance into a comprehensive indicator. Building upon the traditional financial indicator of earnings per share, the Scvps considers positive impacts such as net profit, tax revenue, wages paid to employees, interest expenses, donations, as well as negative impacts such as penalties related to the environment, society, and corporate governance. It comprehensively measures the value creation ability of listed companies. The introduction of Scvps pioneered a comprehensive stakeholder perspective in evaluating company value creation. It represents an important breakthrough and attempt in quantifying ESG value domestically. The calculation of Scvps is primarily based on existing data of financial statements. However, further exploration is still needed to identify key indicators that truly reflect a company's externalized contributions and negative impacts.

The Research Center of the State-owned Assets Supervision and Administration Commission of the State Council (SASAC) has conducted research on the measurement of social value for central state-owned enterprises (SOEs) based on ESG principles<sup>1</sup>. The research focuses on core social issues closely related to stakeholders such as customer service, business partners, employees, and local communities. Representative quantitative indicators have been selected from stakeholder perspectives, such as, the industry chain, investment and financing, communities, and employees. Based on input-output logic, a scientific and reasonable calculation method is designed to monetize and value the social responsibility performance of the entire production and operation process of companies, assess the social performance of central SOEs and provide a reference for exploring effective ways to measure the costs and benefits of off-balance-sheet assets related to corporate social responsibility.

GoldenBee Consulting has been conducting continuous research on the monetized accounting of ESG value (ESG value accounting). In 2017, the company completed the quantification research on social responsibility value as part of the Responsible Competitiveness Project<sup>2</sup>. It has been consistently engaging in the biodiversity valuation and ecological valuation, innovatively providing natural capital accounting services to companies<sup>3</sup>. In 2021, GoldenBee Consulting established Beijing Yibiao Digital

1 Qi Yue, Li Ziyuan, Chen Hui: Establishing a Social Performance Evaluation System with Social Value as the Objective for Central State-owned Enterprises Based on ESG Principles (2023) [J]: Beijing News, 2023.

2 Lu Xinyuan, Yin Gefei. Corporate Responsible Competitiveness: Theoretical Deepening and Quantitative Evaluation Exploration [J]. China WTO Tribune, 2017, 000(1): 56-62.

3 [http://www.cgnpc.com.cn/cgn/c100944/2022-07/01/content\\_b57f68fb1e394df9ba92995e40e1e237.shtml](http://www.cgnpc.com.cn/cgn/c100944/2022-07/01/content_b57f68fb1e394df9ba92995e40e1e237.shtml).



Technology Co., Ltd., and developed the OneESG platform<sup>1</sup> for ESG value accounting. Using Chinese listed companies as samples, the platform calculates indicators such as net ESG value, ESG risk/opportunity value, and ESG price-earnings ratio, providing a visual representation of the externalized value of corporate production and business activities on the environment and society.

### 1.3 The Value of ESG Value Accounting

This is the first report on the methodology and practice of ESG value monetization, aligning with the cutting-edge research trends in global sustainability-related financial information disclosure. The whitepaper is jointly launched by the China Association for Public Companies (CAPCO) and GoldenBee Consulting, member of CAPCO's Sustainability/ESG Committee. Its objective is to explore the forefront practices of ESG value accounting in companies, promote the establishment of a Chinese ESG evaluation system in line with international standards, and facilitate the further development of global sustainable investment and financing.

The role and value of ESG value accounting: first, it is helpful to explore the application scenarios of ISSB standards, facilitating the formation of ESG statements that integrate with financial information. This, in turn, provides decision-making references for investors; second, it supports companies in autonomously disclosing high-quality ESG performance, enabling them to have better control over ESG discourse. This advancement promotes ESG management and performance, offering more useful information for investment decisions; third, it aligns with the research direction of a valuation system with Chinese characteristics, promoting the high-quality development of China's capital market; fourth, ESG value accounting data reflects the results of companies' external impacts on the environment and society. As a result, it provides a solid data foundation for the formulation of sustainable financial policies. Lastly, the ESG value accounting system and methodology represent innovative approaches to ESG evaluation. It helps establish a benchmark for sustainable finance innovation and development in China, and drives sustainable finance development worldwide.

<sup>1</sup> <https://app.oneesg.cn>

## 2. Methodology of ESG Value Accounting for Listed Companies

ESG value accounting is a new ESG assessment methodology that accounts for a company's environmental and social externalities. This chapter illustrates ESG value accounting's practical value, basic approach, how to build and what to include in such a system, accounting result presentation, and the existing challenges. This chapter will unveil the general picture of ESG value accounting to readers.

## 2.1 Practical Value of ESG Value Accounting

Sustainable finance and ESG investing are actions taken by financial stakeholders to help address major sustainability challenges. That is because investors are aware that the external environment for sustainable development, including a healthy environment and a stable society, is key to getting returns. In this process, what is essential is the ability to identify assets and companies with higher sustainability impacts through better data and information.

Currently, sustainability impact is missing in companies' financial performance and related valuation systems. One of the important reasons for this phenomenon is that sustainability impacts are mostly externalized for companies, which means that they are not charged with additional costs for negative environmental or societal impacts or given extra benefits for positive externalities.

According to Paul Samuelson and William Nordhaus, externalities are the uncompensated costs or benefits of production or consumption on other groups. According to this definition, positive externalities refer to the uncompensated positive values generated by companies' business activities that benefit others or society. For example, a company builds and maintains public infrastructure for free in the community where it operates. Negative externalities refer to the uncompensated negative impacts imposed on others or society by companies' business activities, such as the adverse health impacts on residents caused by exhaust emissions.

However, things are changing. First, as growing population and wealth push up consumption, negative externalities such as pollution, carbon emissions, and ecosystem destruction are too obvious to ignore. Second, the public is increasingly informed about corporate externalities as more information is available. Digital tools are making information about externalities spread more widely and rapidly than ever before, while the response of stakeholders such as consumers, communities, employees, and social organizations to corporate negative externalities is increasingly influential. Third, stricter regulation, including financial incentives for positive externalities and higher direct costs such as taxes and penalties for negative externalities, is internalizing corporate externalities. Companies have come to realize that increasing positive externalities and decreasing negative ones can increase revenues, cut costs, and reduce risks, which means externalities have a greater impact on corporate value creation. The disappearing disconnect between corporate and societal value will enable companies to fulfill their social responsibilities and continuously improve their performance.

Therefore, effectively calculating the costs and benefits of a company's environmental and social impacts will help determine its net environmental and social impact. The net impact, or the externalized ESG value of a company, is the key to ensuring and proving that a sustainable investment is effective.

The cost/benefit calculation of environmental and social externalities is based on the marginal

utility theory. In this theory, it is assumed that an individual utility, represented on a fixed numerical scale, can be compared and added. If individual utility is summed, a social welfare function can be established. Utility calculation makes it possible to measure the cost of damage brought by negative externalities and the societal benefits of positive externalities. When the cost of damage caused by an externality equals the benefit of reducing damage, the optimal efficiency benchmark under the cost-benefit optimization scenario can be identified, i.e., the "optimal price" for the negative externality of the damage. It shows how discounted economic value changes with each unit of negative impact. In the same way, the "optimal price" for positive externalities can be determined.

For each environmental and social factor, the optimal price is calculated and then multiplied by the number of each factor to determine the total net impact. The cumulative net impact of all environmental and social factors is the total ESG net impact, or in other words, the ESG value. ESG value accounting is the process of calculating different ESG values, in which the "optimal price" at the cost/benefit equilibrium of every factor serves as an important input parameter. The "optimal price" in this report is referred to as the "monetization factor".

The ESG value accounting system has built a bridge between companies and investors: investors can identify the externalities of companies through the monetized results presented in ESG value accounting. It reveals companies' capabilities, opportunities, and risks in terms of sustainable development, offering a reference for investment decisions and practices. At the same time, ESG value accounting can help companies identify the degree and nature of externalities generated by their production and operation activities and help managers evaluate the compatibility between their business and sustainable development goals. Business managers will be motivated to regularly adjust their business objectives, effectively allocate resources, and reduce negative externalities while improving positive externalities for better ESG governance.

## 2.2 Basic Approach to ESG Value Accounting

Conventional economic value accounting does not reflect the value of a company's externalized impact on the environment and society. As the environmental and social external risk factors faced by companies get increasingly complicated and their impacts are increasingly apparent, the valuation model that only considers economic values may neglect important environmental and social risk factors. This in turn results in the failure of the valuation model and the loss of investment. Thus, it is necessary to conduct ESG value accounting, which is the improvement of the valuation system that puts a sole emphasis on economic values.

ESG value accounting calculates the monetized value of a company's environmental and social externalities and reflects the trend of future valuation changes resulting from different sustainability capabilities and levels.

The basic approach to ESG value accounting is: first, identify the ESG factors that have a significant impact on the environment and society, and determine the constituent factors of ESG value accounting; second, after the constituent factors are confirmed, determine the monetization factor of each factor's externalities, that is, the increase or decrease of the overall social well-being or stakeholder benefits for every one unit change in the factor; third, determine the ESG data input required to complete the

value accounting. Cumulative ESG impact is calculated usually on an annual or semi-annual basis, such as the CO2 emissions of the current year; fourth, account for various ESG factors. The value of each factor added up comes the ESG value; fifth, account for the benchmark of the externalized value of each factor of the industry that the company is involved in, and compare the externalized value of each factor of the company and the industry benchmark to obtain the risk/opportunity value of each ESG factor. Once all values are added up, the accumulated ESG risk/opportunity value of the company is established. A positive ESG risk/opportunity value indicates that the company outperforms other competitors by generating higher positive externalities environmentally and socially, and ESG has a positive impact on the future valuation of the company. In this case, ESG risk/opportunity value refers to the company's sustainability opportunity value. A negative ESG risk/opportunity value suggests that the company creates more negative externalities environmentally and socially than its counterparts, and ESG has a negative impact on the future valuation of the company. In this situation, ESG risk/opportunity value refers to the company's sustainability risk exposure value.

The accounting formula for monetizing net ESG value is as follows:

$$\begin{aligned} \text{Net ESG value} &= \text{externalized value} - \text{externalized cost} \\ &= \text{positive value of environmental factors} - \text{negative value of environmental factors} + \text{positive value of social factors} - \text{negative value of social factors} \\ &= \sum_{i=0}^n \text{factor } i \text{ quantitative performance} * \text{monetization factor of factor } i\text{'s externalities} \end{aligned}$$

The formula for accounting ESG risk/opportunity value is as follows:

$$\begin{aligned} \text{ESG risk/opportunity value} &= \text{potential opportunity value} - \text{potential risk exposure value} \\ &= \text{environmental potential opportunity value} - \text{environmental potential risk exposure value} + \text{social potential opportunity value} - \text{social potential risk exposure value} \\ &= \sum_{i=0}^n \left( \text{factor } i \text{ quantitative performance} * \text{monetization factor of factor } i\text{'s externalities} / \text{size factor} - \text{industry benchmark}^1 \right) * \text{size factor}^2 \end{aligned}$$

<sup>1</sup> The industry benchmark refers to the industry average.

<sup>2</sup> It reflects the drivers of the expansion of externalities, such as a company's output, revenue, or total number of employees. Size factors vary among ESG factors.

ESG value accounting consists of six steps:

(1) Identify environmental and social factors

It is necessary to identify and determine factors that have material impacts on the environment and society from the perspective of a company's business and stakeholders.

(2) Determine quantitative results indicators of environmental and social factors

Based on the material impacts identified in the first step, quantitative results indicators for the corresponding impacts are determined separately. For example, quantitative results indicators in the context of climate change include greenhouse gas (GHG) emissions (tons of CO2 equivalent).

(3) Determine the monetization factor of the externalities of environmental and social factors

Based on the first and second steps, the accounting method for the externalities of environmental and social factors is determined. The core of ESG value accounting lies in the monetization of non-economic impacts. One of the most challenging tasks is to calculate the monetization factor of the externalities caused by environmental and social factors. The latest research globally shows that the calculation of monetization factors is impact-dependent, usually based on compensation costs, restoration costs, prevention costs, and retribution costs. Compensation costs refer to the cost of damage, which is put at the heart of the current environmental externality valuation framework. A case in point is the social cost of carbon. Both restoration and prevention costs are often quantified by referring to costs such as ecological costs, sustainability prices, and carbon reduction costs. Retribution costs monetize externalities induced as a result of breaching legal obligations, such as the cost of government sanctions for certain violations of laws or international regulations.

(4) Enter data

It is required that a company's ESG quantitative data should be sorted out. All ESG quantitative data should realize whole-process traceability to ensure data quality. Some companies may lack certain data due to policy requirements or different rules. In this case, it is stipulated that in ESG accounting, secondary data derived from industry counterparts or statistical models can be applied, which is then scrutinized. ESG data disclosed by companies is classified into different quality levels to ensure data validity. The model of applying secondary data is built by senior ESG analysts according to their analyses of the industry, company, and production process using a variety of regression modeling methods.

(5) Account for ESG value

According to the ESG methods and data (including underlying and supplementary data) determined in the previous three steps, the monetized value of the material impact of each ESG factor is calculated. The monetized value added up comes the ESG value of the company.

Next, the marginal cost or value of each ESG factor is compared with the industry average to calculate the potential opportunity value or potential risk exposure value. The sum of the opportunity value or risk exposure value of each ESG factor is the company's ESG risk/opportunity value.

(6) Apply accounting results to support business and investment decision-making

Companies can use the accounting results for business decision-making. They can analyze the business drivers behind the main positive/negative factors of ESG value and conduct potential ESG competitive advantage/disadvantage analysis by comparing their ESG value with the industry benchmark, from which auxiliary information can be derived for business decision-making. Financial institutions can make investment decisions based on ESG value.

## 2.3 Establishment of ESG Accounting System

The ESG value accounting system includes the identification of ESG factors, the determination of monetization factors, data collection, and ESG value accounting.

### 2.3.1 ESG factor identification and indicator screening

ESG stands for environmental, social, and governance. Environmental factors concern the impact of a company on the environment, including resource utilization, energy efficiency, waste management, GHG emissions, etc. Environmental factor assessments examine a company's environmental impact, sustainable operations, and its capability to tackle climate change and environmental challenges. Social factors focus on the impact of a company on employees, supply chains, communities, customers, and other stakeholders. When it comes to assessing social factors, the impact of a company on its stakeholders and its capability to address social challenges and seize opportunities for sustainable development are assessed. Governance factors deal with aspects of a company's decision-making, management structure, transparency, and accountability. ESG assessments look into a company's corporate governance, board structure, internal controls, code of ethics, and anti-corruption measures to see whether its operations are transparent, compliant with laws, and ethical.

Since ESG value accounting monetizes results, it focuses on the quantitative indicators of environmental and social factors. After assessing the availability of data and monetization factors, the main factors included in ESG value accounting are: GHG emissions, waste and pollutant discharge, resource utilization, gender equality, employee health and safety, employee development, consumer rights, contribution to common prosperity, contribution to rural vitalization, and tax intensity.

When ESG factors are determined, it is necessary to study the major externalities of each factor to corresponding stakeholders, the method of confirming monetization factors, and currently available ESG quantitative indicators to form a table of ESG quantitative indicators. The indicators in relation to seven major factors, namely GHG emissions, gender equality, employee health and safety, employee development, contribution to common prosperity, contribution to rural vitalization, and tax intensity, apply to all industries. Because indicators about waste and pollutant discharge, resource utilization, and consumer rights may vary hugely by industry due to different production models, products, or services, industry-specific ESG indicators are required.

Some industries adopt industry-specific ESG value accounting indicators because of their special ESG contributions. For example, the environmental value of the banking industry may involve the positive externalities from the development of green finance that promotes environmental protection. The social

value indicators of the gaming industry may involve the protection of minors and the prevention of gaming addiction. Specifically, the accounting should include quantitative indicators such as the cost of online gaming addiction and the cost of myopia treatment, which reflects the negative impact of the gaming industry on underage consumers.

Quantitative indicators of environmental value accounting include: carbon fixation, carbon emissions, waste generation, water resource use, etc. (see Table 2-1).

Table 2-1 Major quantitative indicators of environmental value accounting (example)

First-level indicators	Second-level indicators	Third-level indicators
Environmental	GHG emissions	Amount of carbon fixation <sup>1</sup>
		Amount of carbon emissions <sup>2</sup>
	Waste and pollutant discharge	Amount of waste generated <sup>3</sup>
		Quantity of pollutants discharged <sup>4</sup>
	Resource utilization	Amount of resource recycling <sup>5</sup>
		Amount of water use <sup>6</sup>
		Quantity of sustainably certified materials purchased <sup>7</sup>
		Quantity of non-renewable resources purchased <sup>8</sup>
		Amount of land use <sup>9</sup>

<sup>1</sup> The amount of carbon fixation includes the amount of GHGs sequestered by a company through carbon capture, utilization, and storage (CCUS), afforestation, and other methods.

<sup>2</sup> The amount of carbon emissions includes the overall CO<sub>2</sub> emissions emitted by a company or the Scope 1, Scope 2, and Scope 3 emissions.

<sup>3</sup> The amount of waste generated includes general waste and hazardous waste. General waste refers to solid waste that is disposed of or released into the environment and does not include hazardous waste, which may include construction/demolition waste, commercial waste, residential/household waste, grease trap waste, gardening waste, etc. Hazardous wastes refer to all solid wastes contained in Appendix III of the Basel Convention and considered hazardous by China's National Hazardous Waste Inventory.

<sup>4</sup> The quantity of pollutants discharged includes gaseous and liquid pollutants. Gaseous pollutants are molecular pollutants under normal conditions and pressures, such as particulate matter (PM<sub>2.5</sub> and PM<sub>10</sub>), sulfur oxides (sulfur dioxide, etc.), and nitrogen oxides (nitric oxide, nitrogen dioxide, nitrous oxide, dinitrogen pentoxide, etc.). Liquid pollutants are those that turn toxic when discharged into water and cause eutrophication, such as phosphorus in water and nitrogen in soluble and suspended particles.

<sup>5</sup> The amount of resource recycling includes the amount of waste that a company turns into reusable materials, usually including paper, glass, waste metal and plastic products, packaging materials, etc.

<sup>6</sup> The amount of water resources used by a company usually includes the amount of water used by the company for production and daily life (such as the amount of urban tap water and the amount of self-supplied water such as surface water, groundwater, seawater, etc.) and the amount of water recycled by the company directly or after treatment, excluding the amount of reclaimed water purchased by the company from the municipal sewage treatment plant.

<sup>7</sup> The amount of sustainability-certified materials purchased includes raw materials that have been certified as sustainable and responsible, such as certified forest and wood products, fishery products, etc.

<sup>8</sup> The quantity of non-renewable resources includes the non-energy non-renewable resources purchased by the company for the primary businesses, including metal minerals, rare earths, etc.

<sup>9</sup> The amount of land use is usually measured by land use size with the rise and fall of the external ecosystem services when land is used for agriculture, forestry, or industry. For example, the size of land that has been used for commerce, construction, residence, or engineering by a company for the first time.

The indicators of social value accounting mainly include: the number of employees, employee remuneration, the proportion of female employees, spending on employee health and safety, employee training hours, tax payment, and money contributed to common prosperity (see Table 2-2).

Table 2-2 Major quantitative indicators of social value accounting (example)

First-level indicators	Second-level indicators	Third-level indicators
Social	Gender equality	Proportion of female employees
		Employee remuneration
		Number of employees
	Employee health and safety	Spending on employee health and safety
		Lost days due to work injury
		Work-related fatalities
	Employee development	Employee training hours
	Consumer rights	Specific indicators analyzed by industry
	Tax intensity	Tax payment
		Revenue
	Contribution to common prosperity	Total charitable investments
		Various types of charitable investments
	Contribution to rural vitalization	Number of jobs created in key counties of rural vitalization

### 2.3.2 Determination of monetization factors for ESG value accounting

The monetization factor of ESG value accounting has been discussed globally by authoritative institutions in related researches. After a systematic analysis of methodologies mentioned in the *Natural Capital Protocol*, the *Social & Human Capital Protocol*, *Ture Price*, *Impact-weighted Accounts*, and *Ecosystem Assessment, Ecosystem assessment: Guidelines for gross ecosystem product accounting*, methods to calculate ESG monetization factors are determined given the basic approach to ESG value accounting, the reality in China, industrial structure, industry characteristics, corporate operation and management characteristics, etc.

There are three methods to calculate monetization factors:

The first method is to choose the optimal price at the cost-benefit equilibrium of externalities as the monetization factor. According to the marginal utility theory, we analyze the equilibrium between the damage cost (or restoration cost and retribution cost) of an impact and the benefit of reducing the damage (for the positive impact, we analyze the positive benefit and the cost of incremental benefit) and calculate the change in discounted societal well-being with each unit of impact. This method for determining the monetization factor is ideal. For environmental factors such as emissions and pollution, the damage cost is suitable, while for environmental factors such as resource utilization and biodiversity, restoration cost shall prevail.

For example, when calculating the marginal cost of carbon emissions, we refer to Nobel Prize laureate William D. Nordhaus's estimates of the social cost of carbon (SCC). This concept represents the economic cost caused by an additional ton of CO<sub>2</sub> emissions or its equivalent. Nordhaus believes that SCC reflects the change in discounted societal well-being for each incremental unit of CO<sub>2</sub> equivalent and is a core tool for developing GHG regulatory policies. SCC estimates are complex because they take into account carbon emissions, the carbon cycle, and climate change impacts, including the economic losses caused by climate change. When establishing the SCC model, given the complexity of SSC estimates, Nordhaus takes the marginal welfare impact of emissions and the marginal welfare impact per unit of total consumption as variables. In addition, since SCC estimates continue to rise, Nordhaus puts SCC in the early SCC-free model to revise the valuation of the baseline scenario upward. In the 1992 model, the SCC valuation of the 2020 baseline scenario is 129.22 yuan/tCO<sub>2</sub>e, while the 2020 baseline scenario SCC valuation in the 2023 model is 437.91 yuan/tCO<sub>2</sub>e.

Nordhaus's research is science-based because it fully considers the dynamics of climate change damage, discount rate, and economic output, which are reflected in model modification. Thus, the latest SCC estimate can serve as a monetization factor for environmental externality valuation. The Global Energy Interconnection Development and Cooperation Organization has looked into SCC based on China's carbon reduction pathways and energy and power transition plans. It is shown that the whole-society marginal emission reduction cost is 258 yuan/tCO<sub>2</sub>e under the context of building China's energy Internet, adopting clean energy such as photovoltaic and wind power and establish a power trading network to achieve carbon neutrality. Considering the availability and comparability of Scope 3 emissions, we only add up Scope 1 and 2 emissions as the input data and choose the China-specific SCC result as the monetization factor to calculate the marginal cost of carbon emissions in line with the reality of companies listed in China.

The second method to determine the monetization factor is to calculate the incremental value to stakeholders generated by the company's investment in a specific factor. Some factors require an alternative approach because it is difficult to determine the monetization factor using the first method. Alternatively, we calculate the incremental external value generated by corporate investment in a specific factor, especially in some social aspects. For example, when calculating the marginal social benefits of corporate investment in education, we refer to the World Bank's 2014 study on the relationship between education and income. Covering 139 economies in 819 universal household surveys, the study gathers data spanning nearly 60 years from 1970 to 2013 that reflects personal education costs and benefits. Through modeling, it estimates the returns on education, that is, the estimated increase in income in the labor market to one more year of education. For China, the rate is about 16.6%. To some extent, it suggests the positive externalities of spending on education on the recipients and therefore can be used as a monetization factor to calculate the marginal benefit of spending on education to society.

The third method is to replace the incremental value with corporate investment in a specific factor when the first two methods are not feasible. For example, when measuring corporate contributions to gender equality, it is not yet possible to fully reflect the social value of promoting gender equality. Instead, we focus on corporate contributions such as longer childbirth or childcare leaves for women employees than males. The cost of such longer paid leaves for women imposed on a company is calculated as part of its contributions to gender equality.

### 2.3.3 Result of ESG value accounting

When the underlying and supplementary data of ESG quantitative indicators and appropriate monetization factors are passed into the net ESG value formula, the monetized value, or the net ESG value, of each environmental and social factor can be calculated. Since governance factors are seen as intermediate variables in ESG value accounting and their value is reflected in environmental and social value, there is no need to separately account for ESG governance factors.

After the net ESG value is obtained, the value of each ESG factor is compared with the industry average to get the potential opportunity/risk exposure value of each ESG factor using the ESG risk/opportunity value formula. The sum of all results is the overall ESG risk/opportunity value of the company. However, industry data availability may pose a challenge for listed companies when they account for their ESG risk/opportunity values.

Listed companies can present the net ESG value of each environmental and social factor in an ESG value accounting statement (ESG statement for short). Similar to financial statements, ESG value accounting statements include a list of environmental and social factors as well as the accounting results of current and previous net ESG value. Sharp value fluctuation in some ESG factors can be supplemented with indicator-specific explanation (see Table 2-3). ESG value accounting statements provide investors and companies with verifiable, evidence-based, and comparable monetized ESG value that can be referred to in decision-making.

Table 2-3 ESG value accounting statement (example)

Item	Data (Most recent reporting period)	Data (current reporting period)	Explanation/ note
<b>1. Net ESG value of environmental factors</b>			
<b>GHG emissions:</b>			
Amount of carbon fixation			
Amount of CCUS			
Size of planted trees			
CO <sub>2</sub> emissions			
Scope 1 emissions			
Scope 2 emissions			
Scope 3 emissions			
<b>Net GHG emissions</b>			
<b>Waste and pollutant discharge:</b>			
Amount of waste generated			

Item	Data (Most recent reporting period)	Data (current reporting period)	Explanation/ note
General solid waste generated			
Hazardous solid waste generated			
Amount of pollutant discharged			
Gaseous pollutant			
Liquid pollutant			
<b>Net value of waste and pollutant discharged</b>			
<b>Resource utilization:</b>			
Amount of resource recycling			
Plastics recycled			
Paper recycled			
Metal recycled			
Other materials recycled			
Amount of water use			
Fresh water consumed			
Volume of non-renewable resources purchased (non-energy)			
Rare earth			
Iron ore			
Other non-renewable resources			
Amount of land use			
Size of nature converted for commerce or construction			
Size of nature reclaimed from commerce or construction			
<b>Net value of resource utilization</b>			
<b>Total net ESG value of environmental factors</b>			
<b>2. Net ESG value of social factors</b>			
<b>Gender equality:</b>			
Proportion of female employees			

Item	Data (Most recent reporting period)	Data (current reporting period)	Explanation/ note
Employee remuneration			
Number of employees			
<b>Net value of gender equality</b>			
<b>Employee health and safety:</b>			
Spending on employee health and safety			
Lost days due to work injury			
Work-related fatalities			
<b>Net value of employee health and safety</b>			
<b>Employee development:</b>			
Employee training hours			
<b>Net value of employee development</b>			
<b>Tax intensity:</b>			
Tax payment			
Revenue			
<b>Net value of tax intensity</b>			
<b>Contribution to common prosperity:</b>			
Spending on education			
Donations for public health infrastructure			
Donations for infrastructure other than public health			
Other charitable spending			
<b>Net value of contribution to common prosperity</b>			
<b>Contribution to rural vitalization:</b>			
Number of jobs created in key counties of rural vitalization			
<b>Net value of contribution to rural vitalization</b>			
<b>Total net ESG value of social factors</b>			
<b>3.Total net ESG value</b>			

## 2.4 Challenges in ESG Value Accounting

First, data disclosed is not comprehensive, quantified, consistent, and comparable, which may result in accounting inaccuracy. The listed company has to disclose data of the whole corporate group, including data from holding subsidiaries and the core supply chain. It remains a challenge to maintain the completeness and accuracy of data. In addition, the lack of universally agreed frameworks, standards, and rules makes it difficult to standardize corporate disclosure. Some key quantitative information is even missing. The overall comparability of ESG key information needs to be improved. There is also a tendency for companies to disclose positive information while leaving some information unreported.

Second, ESG data is mostly updated annually, and it is difficult for investment institutions to make flexible analyses and judgments on ESG risks and values based on the assessment results, leading to the limited application of ESG investing strategies. Investors need to accurately identify the ESG risks and opportunities of companies in time to evaluate the sustainability of a company and its business before making judgments on the value of investment targets. Currently, ESG data is mainly found in annually released financial statements, ESG reports, and social responsibility reports. Meanwhile, ESG data has more to do with what a company did at a certain point in the past. When the report is released, the data collected is already out of date and less useful in assessing the long-term investment value of a company.

Finally, the methodology of ESG value accounting is still in its infancy. Methods to evaluate externalities mainly include the basic utility paradigm<sup>1</sup>, the emission reduction paradigm<sup>2</sup>, and the shadow pricing paradigm<sup>3</sup>. Different ESG factors require different externality evaluations where further studies are needed. Externality evaluation of each ESG factor involves the input of related social and environmental variables, some of which do not come from reliable sources. Variables may differ depending on the industry, region, time, etc. In addition, consensus on ESG factors' externalities and market pricing mechanisms should be further developed. The ESG factors that have been accounted for in this version of the ESG value accounting methodology are all derived from authoritative statistics or research results of government agencies or well-known academic institutions. Some accounting methods for ESG factors are still being developed.

<sup>1</sup> Assuming that everyone has preferences, which can be represented by a fixed number that will be compared and added. In this way, the compensation cost of negative externalities is the sum of negative impacts on individual utility. Similarly, social benefits are measurable. This approach is based on the social cost-benefit analysis. If the sum of all benefits is higher than the sum of all costs, then a decision is beneficial from a societal point of view.

<sup>2</sup> Starting with the concept of carbon reduction cost or benefit. First, it assumes certain policy goals, such as zero emissions. The carbon reduction costs or benefits of externalities are the additional or avoidable restoration or compensation costs incurred to achieve policy objectives.

<sup>3</sup> The "optimal price" of the negative externality can be calculated based on compensation and restoration costs, since compensation cost equals restoration cost, which is known as the shadow price.

## 3. Data from Listed Companies for ESG Accounting

The quantitative ESG data provides basic input for the ESG accounting. This chapter analyzes the disclosure of quantitative ESG data from Chinese A-share listed companies<sup>1</sup> and mainland companies listed on Hong Kong Stock Exchange<sup>2</sup> (SEHK), as sample companies, from 2017 to 2022<sup>3</sup>.

### 3.1 Overall Assessment of ESG Disclosure by Listed Companies

This section concludes the number of ESG-related reports (including CSR reports, sustainability reports and ESG reports) released by listed companies from 2017 to 2022, including the overall data of listed companies, data from Hong Kong Stock Exchange (SEHK), Shanghai Stock Exchange(SSE) and Shenzhen Stock Exchange(SZSE) and data released by major industries. The data presented in this report, released this year, pertains to the previous year's information. The counting of released reports ended in October 2023, and the previous numbers were reviewed and corrected.

#### 3.1.1 ESG reports in general

From 2017 to 2022, the number of ESG reports released by listed companies was on the rise. In 2022, the issuance rate of ESG reports among listed companies reached 47.70%, 9.44% higher compared with the 38.26% in 2017 (Figure 3-1).

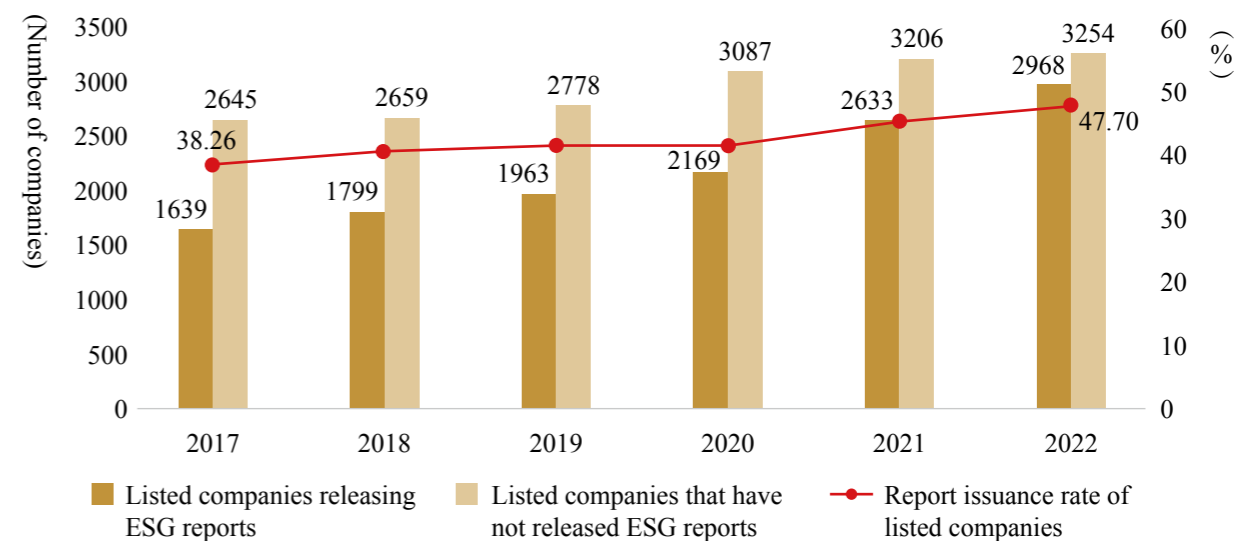


Figure 3-1 ESG reports among listed companies from 2017 to 2022

<sup>1</sup> The A-share listed companies selected herein include those listed on Shanghai Stock Exchange, Shenzhen Stock Exchange or Beijing Stock Exchange in that year. The assessment is based on the data of A-share listed companies from Wind Economic Database released in December 2022.

<sup>2</sup> The number of mainland companies listed on SEHK is concluded from the Chinese shares on SEHK from Wind Economic Database (including H-shares, red chips and Chinese private shares), and delisted companies in that year are also included.

<sup>3</sup> The data in Chapter 3 and Chapter 4 is from OneESG (oneesg.cn).



In 2022, there were 1,810 A-share listed companies that issued ESG reports, with 36.29% of issuance rate, which was 10.85% higher compared to the 25.44% in 2017. Among the 1,234 mainland companies listed on SEHK, 1,158 companies released their ESG reports, reaching 93.84% of issuance rate and a rise of 8.11% compared with the 85.73% in 2017 (Table 3-1).

Table 3-1 ESG reports from listed companies

Year	Mainland companies listed on SEHK			A shares		
	Total listed companies	Listed companies releasing ESG reports	Report issuance rate	Total listed companies	Listed companies releasing ESG reports	Report issuance rate
2017	911	781	85.73%	3373	858	25.44%
2018	980	870	88.78%	3478	929	26.71%
2019	1060	969	91.42%	3681	994	27.00%
2020	1139	1043	91.57%	4117	1126	27.35%
2021	1198	1144	95.49%	4641	1489	32.08%
2022	1234	1158	93.84%	4988	1810	36.29%

### 3.1.2 ESG reports from listed companies on three stock exchanges

The sample selection starts from 2017, as the Hong Kong Stock Exchange (hereinafter referred to as SEHK) implemented the "comply or explain" provision since January 1, 2016. From 2017 to 2022, the number and share of ESG reports from companies listed on the SEHK, Shanghai Stock Exchange and Shenzhen Stock Exchange were rising.

The ESG reports from companies listed on Shanghai Stock Exchange increased from 508 in 2017 to 1,005 in 2022, with the issuance rate climbing from 37.71% up to 46.74%. The ESG reports from companies listed on Shenzhen Stock Exchange increased from 350 in 2017 to 805 in 2022, with the issuance rate inching from 17.28% to 29.67%. The ESG reports from mainland companies listed on SEHK increased from 781 in 2017 to 1,158 in 2022, with the issuance rate rising from 85.73% to 93.84% (Figure 3-2).

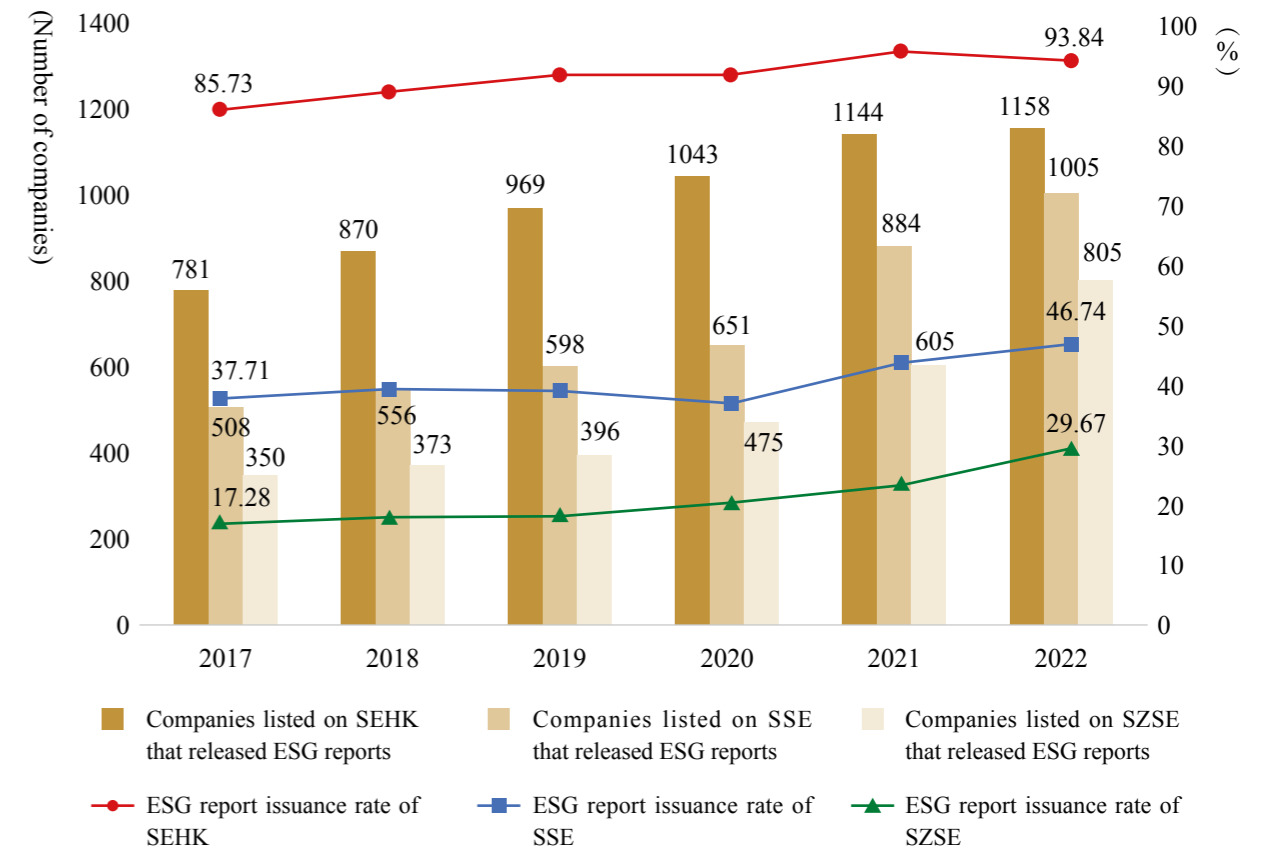


Figure 3-2 ESG reports from companies listed on three stock exchanges

### 3.1.3 ESG reports from listed companies in industries

In regard to the classification of listed companies by industries, this report throws light on the investment value of these companies and the materiality of ESG in different industries. The method in this report mainly adheres to the Guidelines on Industry Classification of Listed Companies from China Securities Regulatory Commission<sup>1</sup>, Hang Seng Industry Classification System and Shenyin & Wanguo Industry Classification Standard<sup>2</sup>, and refers to the standards of MSCI ESG Ratings and SASB. Three industry levels are set in terms of the materiality of ESG related risks and opportunities. Specifically, there are 31 primary industries, 128 secondary industries and 176 tertiary industries. In 2022, the ESG report issuance rates among listed companies in 31 primary industries all surpassed 30%.

<sup>1</sup> The Guidelines on Industry Classification of Listed Companies issued by China Securities Regulatory Commission is on the basis of the standard of the National Bureau of Statistics, and refers to major international management-oriented classification standards, thus featuring typical management elements. The management-oriented classification standards, based on the output of the economy, aim to reflect the internal structure and development of the national economy.

<sup>2</sup> The Shenyin & Wanguo Industry Classification Standard is an investment-oriented industry classification standard. It gives thought to the connection between listed companies products and services, and China's industrial development and characteristics. The investment-oriented classification standards consider both revenue and source of revenue. The goal is to assist investors in investment assessment, performance evaluation, asset allocation and other behaviors, and to unearth the distinctive investment values of different industries. (Source: Development Research. Comparative Study of Management-oriented and Investment-oriented Industry Classification Standards, 2003).

Among the 31 primary industries, the media, non-banking financial industry, banking, social services as well as commercial and retail industries are subject to the service industry. Specifically, the issuance rate among listed companies in the banking industry is the highest, and remains 100% since 2019. In 2022, all banking companies released ESG reports except for one that suspended trading. The non-banking financial industry is blessed with high issuance rate as well, keeping over 80% from 2019 to 2022. In 2022, its ESG report issuance rate was 87.82%, 12.21% higher compared to 2017. The rates in the media industry, social services industry and commercial and retail industry is also rising over the past six years, with an increase of 19.71%, 15.24% and 17.58% respectively in 2022 compared to 2017 (Figure 3-3).

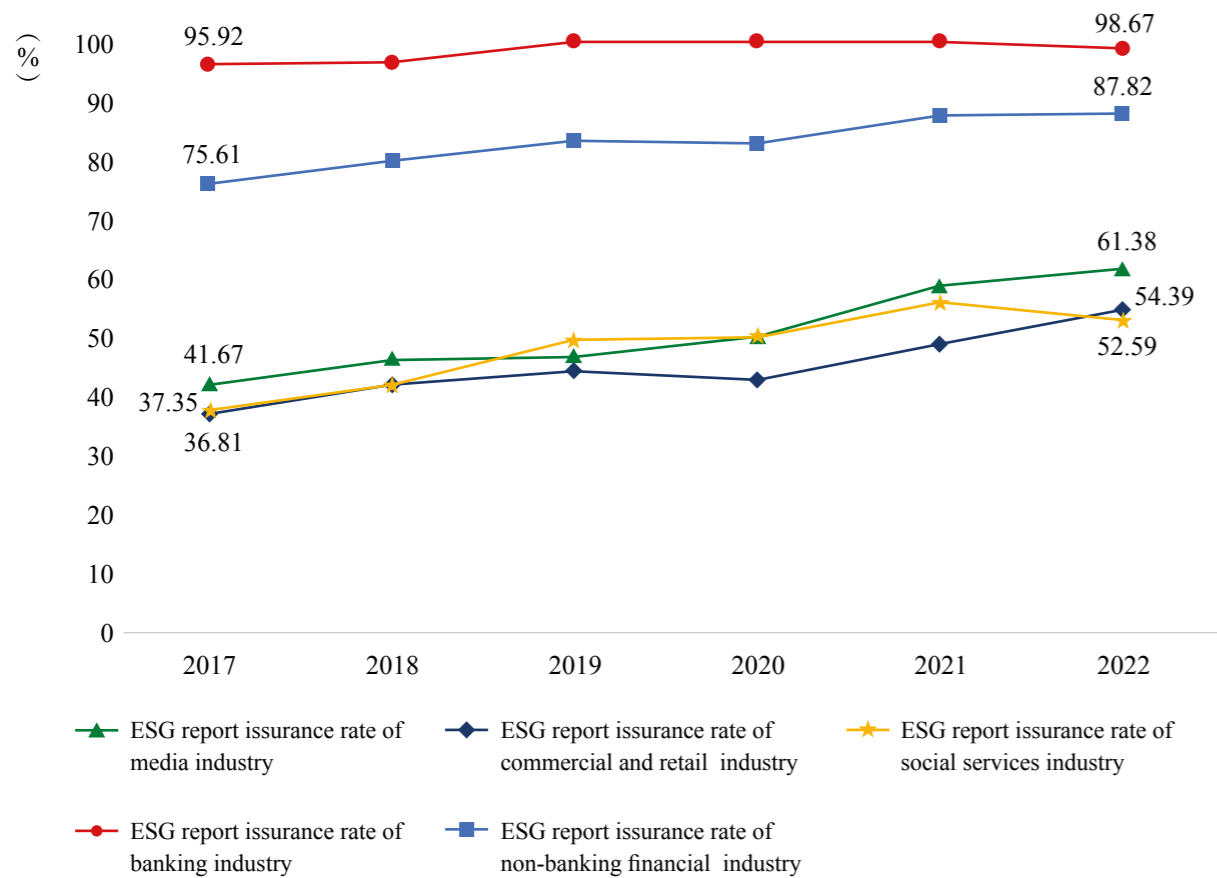


Figure 3-3 Issuance rates of ESG reports among listed companies in the service industry

The public utility<sup>1</sup>, petroleum & petrochemicals, basic chemical, iron & steel, non-ferrous metal, light manufacturing industry<sup>2</sup>, transportation, building materials are key carbon emission reduction industries. In 2022, the average ESG report issuance rate among iron and steel, petroleum & petrochemicals, transportation, public utility sector, non-ferrous metal and building materials was over 50%. Among them, the rates of iron and steel, public utility, petroleum & petrochemicals and transportation surpassed 70%. Iron & steel led the pack with a 77.42% issuance rate in 2022, a 17.04% increase from 2017. During the same period, public utilities (72.22%), petroleum & petrochemicals (72.15%), and transportation (70.52%) also saw significant upticks, seeing 15.83%, 17.86%, and 14.89% growth respectively. Building materials (52.53%) and non-ferrous metals (55.28%) followed suit, with increases of 20.03% and 8.36% respectively. The issue rates in basic chemical and light manufacturing industry were on the rise, jumping by 9.72% and 10.92% respectively compared to 2017.

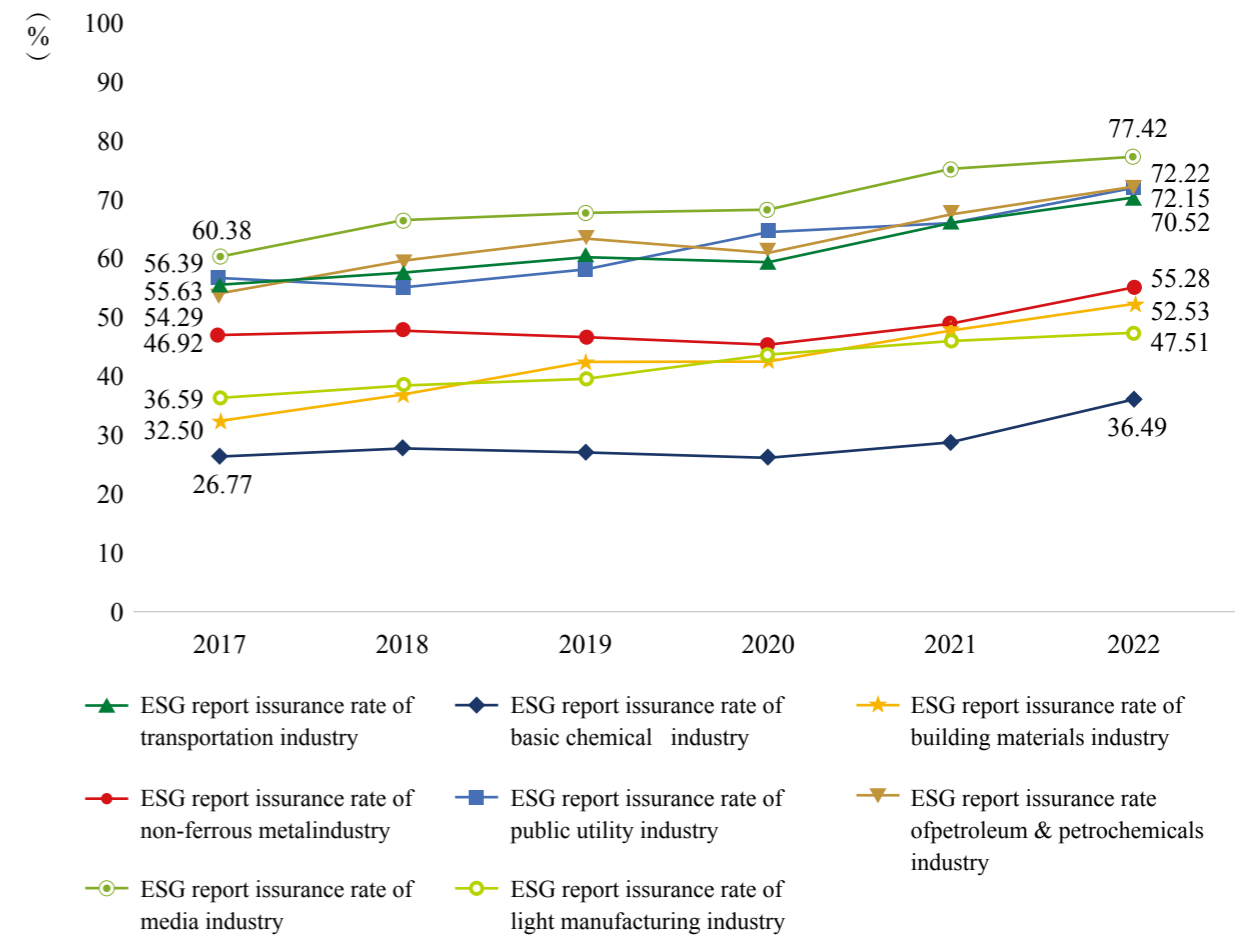


Figure 3-4 ESG report issuance rates of listed companies in key carbon emission reduction industries

<sup>1</sup> As a carbon emission reduction industry, the power generation industry is also a secondary industry under the public utility sector. For consistency, it is classified as a primary industry under the public utility sector.  
<sup>2</sup> As a carbon emission reduction industry, the paper industry is also a secondary industry under the light manufacturing industry. For consistency, it is classified as a primary industry under the light manufacturing industry.

### 3.2 ESG Indicator Disclosure Rates Among Listed Companies

This section unfolds with the analysis on the disclosure of environmental and social indicators by listed companies required for ESG accounting.

#### 3.2.1 Analysis of environmental indicator disclosure

The quantitative indices for environmental value accounting include the use of resources, GHG emissions and waste discharged, etc.

##### (1) GHG emissions

The GHG emissions calculated in this report are represented by the CO2 equivalents (CO2e) disclosed by companies. The CO2 emissions are the aggregate of the direct emissions (Scope 1) and the indirect emissions (Scope 2), excluding the Scope 3 indirect emissions.

From 2017 to 2022, the number of companies disclosing CO2 emissions and the disclosure rate were rising (Figure 3-5). The disclosure rate of CO2 emissions increased by 6.67%, from 50.34% to 57.01%. The disclosure rate of Scope 3 emissions also showed an upward trend, from 8.60% in 2017 to 12.47% in 2022, with an increase of 3.87% (Figure 3-5).

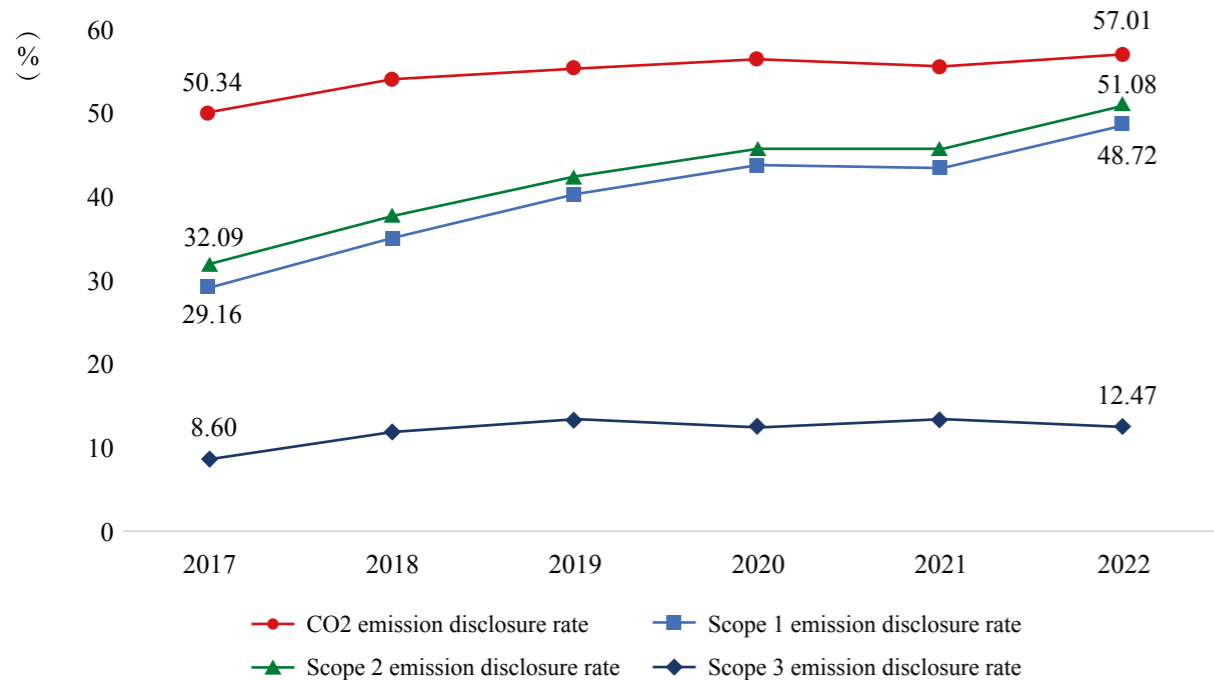


Figure 3-5 CO2 emissions disclosure rate among listed companies

##### (2) Waste discharged

The waste calculated in this report include general solid waste and hazardous solid waste generated.

From 2017 to 2022, the number of companies disclosing waste saw sustained growth (Table 3-2). In 2022, the disclosure rate of general solid waste generated was 50.03%, increasing by 11.29% compared with the 38.74% in 2017. The rate of hazardous solid waste generated was 45.08%, increasing by 13.54% compared with the 31.54% in 2017 (Figure 3-6).

Table 3-2 Waste disclosed by listed companies

Category	Indicator	Year					
		2017	2018	2019	2020	2021	2022
A-share listed companies	General solid waste generated	102	124	175	240	308	544
	Hazardous solid waste generated	110	161	221	287	327	598
Mainland companies listed on SEHK	General solid waste generated	535	646	740	820	898	941
	Hazardous solid waste generated	407	496	605	668	691	740

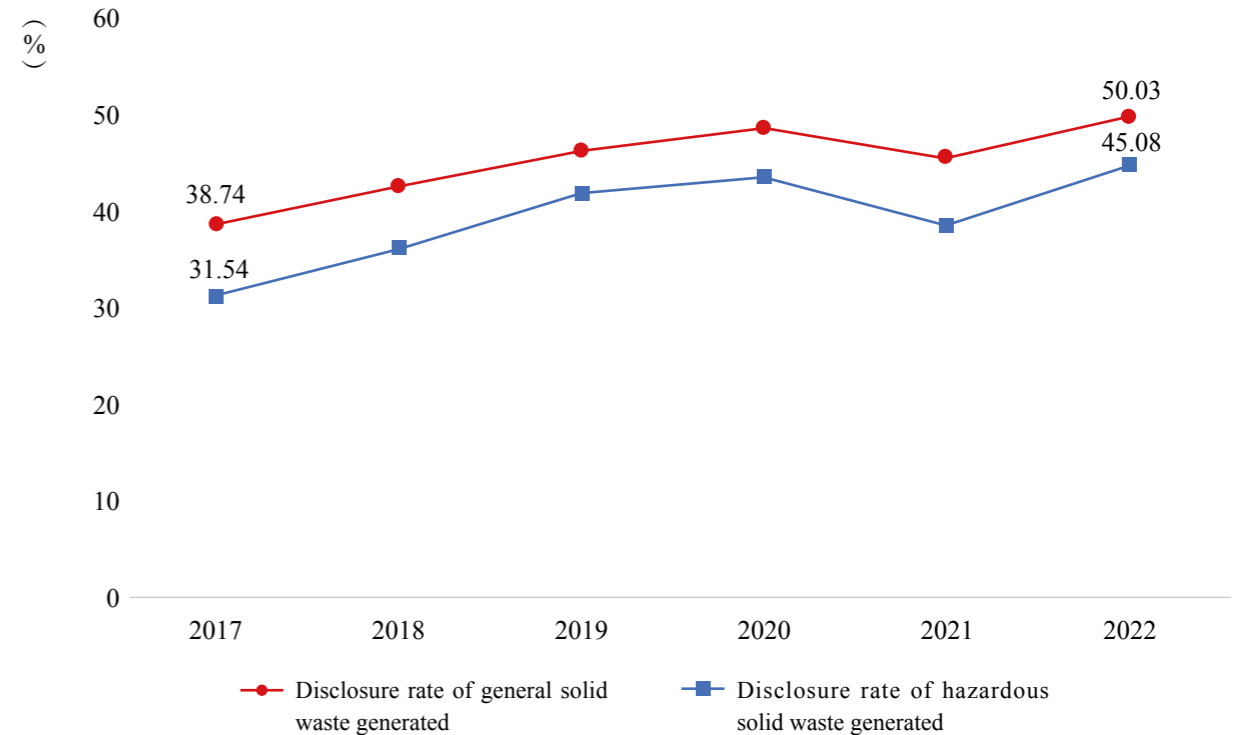


Figure 3-6 Disclosure rate of waste generated by listed companies

### (3) Pollutant discharge

The pollutant discharge calculated in this report mainly focus on gaseous pollutant emissions and liquid pollutant discharge. Specifically, the gaseous pollutant emissions mainly include particulate matter, sulfur oxides and nitrogen oxides. The liquid pollutant discharge mainly include chemical oxygen demand, ammonia nitrogen, total phosphorus emissions and total nitrogen emissions.

From 2017 to 2022, the disclosure rate of major gaseous pollutant emissions by listed companies was on the rise (Table 3-3 and Figure 3-7). In 2022, the disclosure rate of particulate matter emissions was 54.01%, increasing by 19.11% from 2017 (34.90%). The rate of sulfur oxide emissions was 55.73%, a 6.43% increase from 2017 (49.30%). The nitrogen oxides emissions had a 59.43% disclosure rate, up by 10.31% from 2017 (49.12%) (Figure 3-7).

Table 3-3 Number of listed companies disclosing gaseous pollutant emissions

Category	Indicator	Year					
		2017	2018	2019	2020	2021	2022
A-share listed companies	Particulate matter emissions	219	586	653	758	932	935
	Sulfur oxide emissions	379	655	719	798	912	918
	Nitrogen oxide emissions	385	675	752	847	982	1031
Mainland companies listed on SEHK	Particulate matter emissions	353	455	537	614	620	668
	Sulfur oxide emissions	429	525	606	678	674	736
	Nitrogen oxide emissions	420	523	612	688	690	733

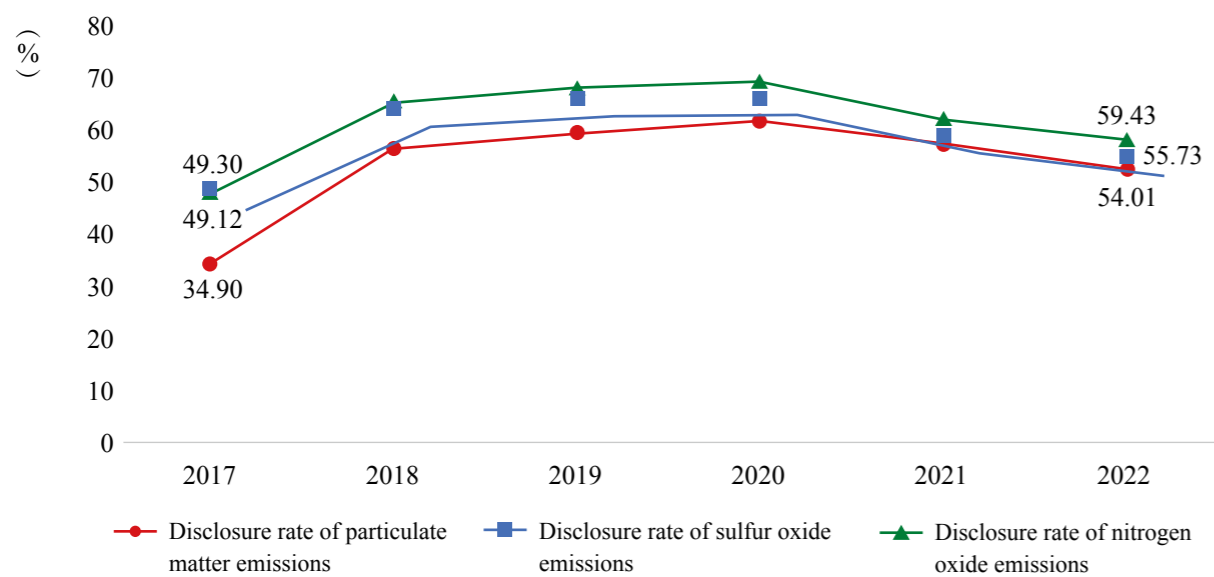


Figure 3-7 Disclosure rate of gaseous pollutant emissions by listed companies

From 2017 to 2022, the disclosure rate of major liquid pollutant discharge by listed companies was on the rise (Table 3-3 and Figure 3-8). In 2022, the disclosure rate of chemical oxygen demand was 48.58%, increasing by 15.57% compared with the 33.01% in 2017. The rate of total phosphorus emissions was 14.18%, increasing by 11.01% compared with the 3.17% in 2017. The rate of total nitrogen emissions was 13.48%, increasing by 11.71% compared with the 1.77% in 2017. The rate of total nitrogen emissions was 43.90%, increasing by 15.90% compared with the 28.00% in 2017 (Figure 3-8).

Table 3-4 Number of listed companies disclosing liquid pollutant discharge

Category	Indicator	Year					
		2017	2018	2019	2020	2021	2022
A-share listed companies	Chemical oxygen demand	437	831	892	999	1164	1284
	Total phosphorus emissions	49	163	224	294	410	398
	Total nitrogen emissions	27	99	174	247	383	383
	Ammonia nitrogen emissions	387	754	807	916	1104	1172
Mainland companies listed on SEHK	Chemical oxygen demand	104	125	116	128	145	158
	Total phosphorus emissions	3	10	17	22	29	23
	Total nitrogen emissions	2	5	13	16	23	17
	Ammonia nitrogen emissions	72	98	89	104	123	131

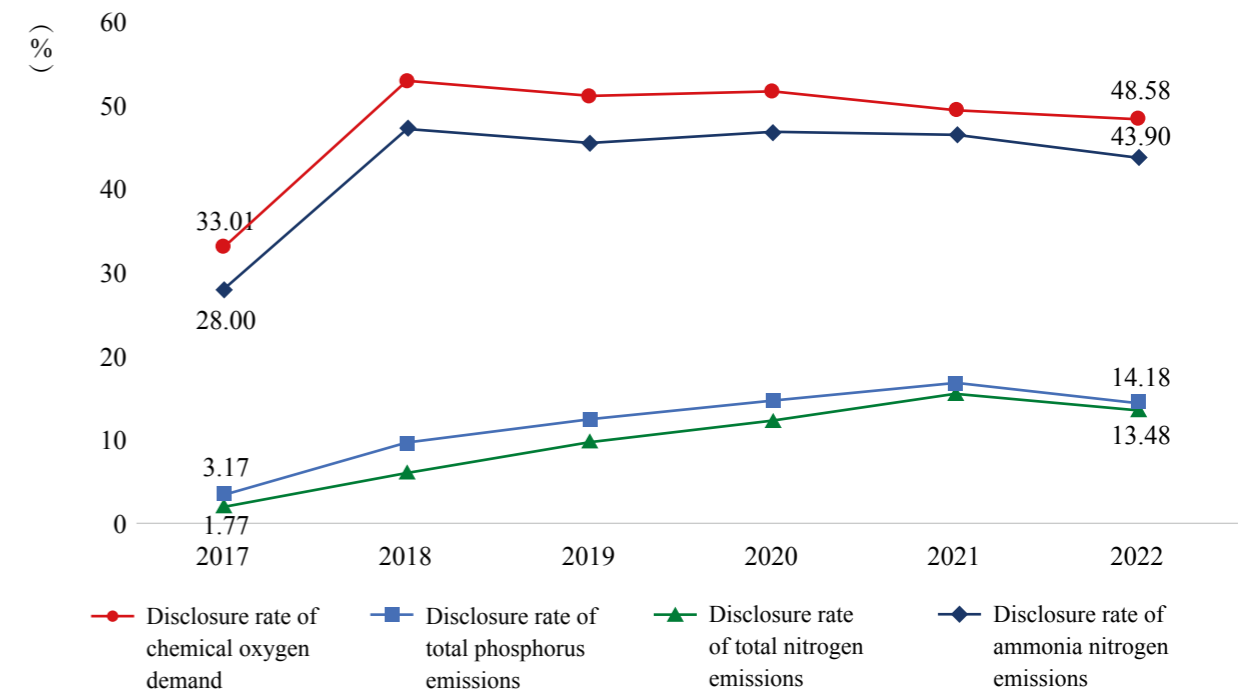


Figure 3-8 Disclosure rate of liquid pollutant discharged by listed companies

### 3.2.2 Assessment of social indicator disclosure

The quantitative social indicators for accounting include the proportion of female employees, training hours per employee, employee turnover rate, work-related fatalities and lost days due to work injury, spending on social welfare and rural vitalization, etc.

#### (1) Employee diversity

From 2017 to 2022, the number of listed companies disclosing their female employee proportions was rising, so was the disclosure rate, which increased by 24.48% from 43.44% in 2017 to 67.92% in 2022 (Figure 3-9).

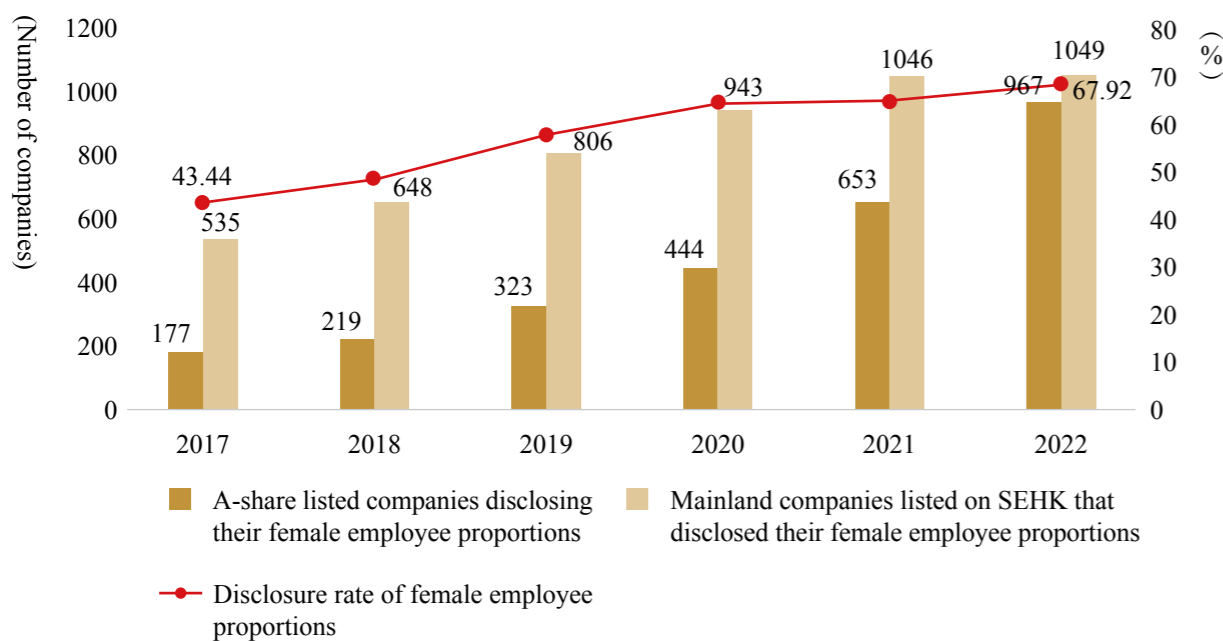


Figure 3-9 Number of listed companies disclosing female employee proportion and disclosure rate

#### (2) Employee training, health and safety

The indicators for employee training, health and safety calculated in this report include training hours per employee, spending on employee health and safety, work-related fatality and lost days due to work injury, etc. Such information as the work-related fatality and lost days due to work injury are negative for companies, though. The disclosure of such information in companies' reports can help investors catch their ESG information more comprehensively and enhances the subjectivity and credibility of reporting.

From 2017 to 2022, the disclosure rate of employee training, health and safety indicators was on the rise (Table 3-5 and Figure 3-10). In 2022, the disclosure rates of training hours per employee and spending on employee health and safety were 51.99% and 18.36% respectively, up 21.24% and 11.47% compared to 2017. The rates of lost days due to work injury and work-related fatalities were 41.91% and 47.20%, increasing by 19.40% and 15.47% respectively compared with the 22.51% and 31.73% in 2017 (Figure 3-10).

Table 3-5 Number of listed companies disclosing per capita training hour and spending on employee health and safety

Category	Indicator	Year					
		2017	2018	2019	2020	2021	2022
A-share listed companies	Spending on employee health and safety	76	118	172	214	297	443
	Per capita training hour	126	184	288	348	464	678
	Lost days due to work injuries	46	72	158	204	246	332
	Work-related fatalities	126	168	298	367	437	515
Mainland companies listed on SEHK	Spending on employee health and safety	37	45	67	80	69	102
	Per capita training hour	378	463	581	741	878	865
	Lost days due to work injuries	323	402	546	649	847	912
	Work-related fatalities	394	507	725	823	879	886

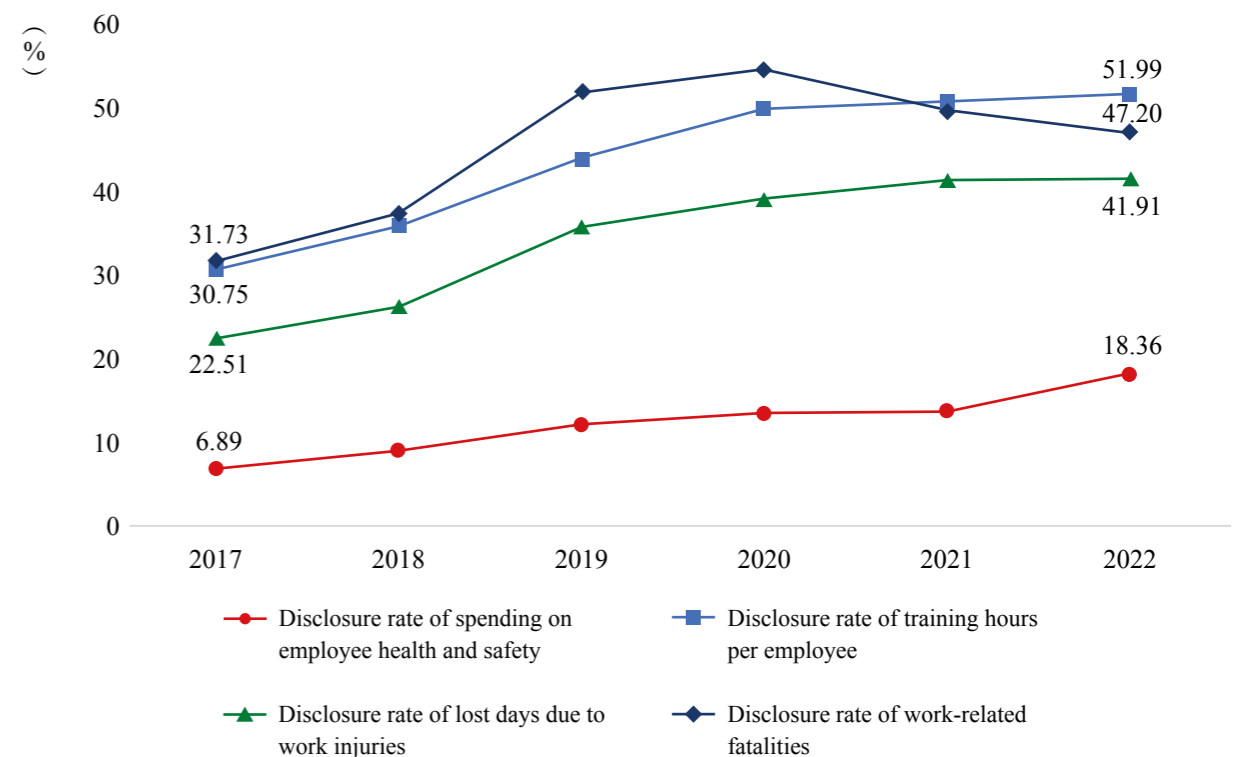


Figure 3-10 Disclosure rates of training hours per employee and spending on employee health and safety by listed companies

### (3) Contribution to common prosperity

The indicators for contribution to common prosperity calculated in this report include spending on public welfare, spending on education and spending on rural vitalization.

The number of A-share listed companies disclosing spending on public welfare increased from 1,855 in 2017 to 3,790 in 2022, growing steadily (Table 3-6). Given that the spending on public welfare is not a SEHK indicator, the number of mainland companies listed on SEHK disclosing such indicator is increasing rather slowly, from 301 in 2017 to 591 in 2022 (Table 3-6).

The indicators for contribution to common prosperity calculated in this report include spending on public welfare, spending on education and spending on rural vitalization.

Companies usually disclose their overall spending on public welfare along with outstanding cases, and optionally reveal their spending on education and rural vitalization. Thus, the number of A-share listed companies and mainland companies listed on SEHK disclosing spending on education and spending on rural vitalization stays relatively stable (Table 3-6).

Table 3-6 Number of listed companies disclosing contribution to common prosperity

Category	Indicator	Year					
		2017	2018	2019	2020	2021	2022
A-share listed companies	Spending on public welfare	1855	2016	2059	2643	2692	3790
	Spending on education	488	765	752	779	413	627
	Spending on rural vitalization	588	892	892	978	676	632
Mainland companies listed on SEHK	Spending on public welfare	301	338	397	507	425	591
	Spending on education	143	162	183	169	114	75
	Spending on rural vitalization	112	146	151	165	149	61

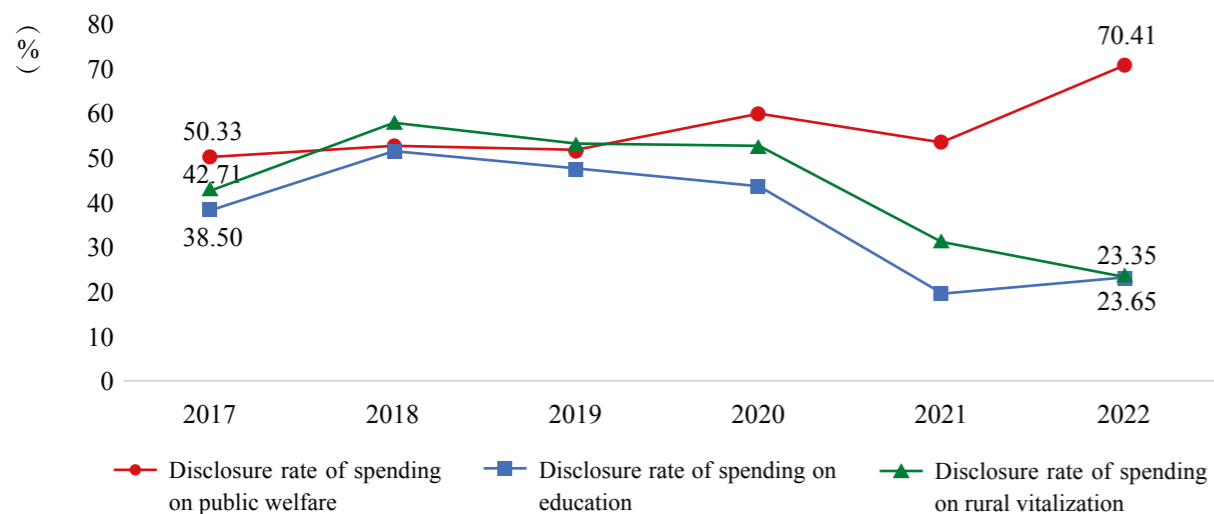


Figure 3-11 Disclosure rate of contribution to common prosperity by listed companies

### (4) Contribution to rural vitalization

The indicators for contribution to rural vitalization in this report include jobs created for key counties for national rural vitalization and employees hired from key counties for national rural vitalization.

The data regarding targeted poverty alleviation calculated in this report is sourced from the annual reports of listed companies from 2017 to 2020. There are clear standards and specific indicators required for the disclosure of targeted poverty alleviation. From the indicators we can acquire such quantitative data as the number of jobs created for and employees hired from key counties for national rural vitalization. Since 2021, listed companies are no longer required to disclose targeted poverty alleviation information, instead can optionally disclose information related to rural vitalization free from restrictions on the content and format. The disclosure of contribution to rural vitalization by listed companies is rather flexible in terms of content and format. Therefore, these two indicators are not our priorities to assess. As a result, since 2021, the number of companies disclosing contribution to rural vitalization and the disclosure rate are on the decline.

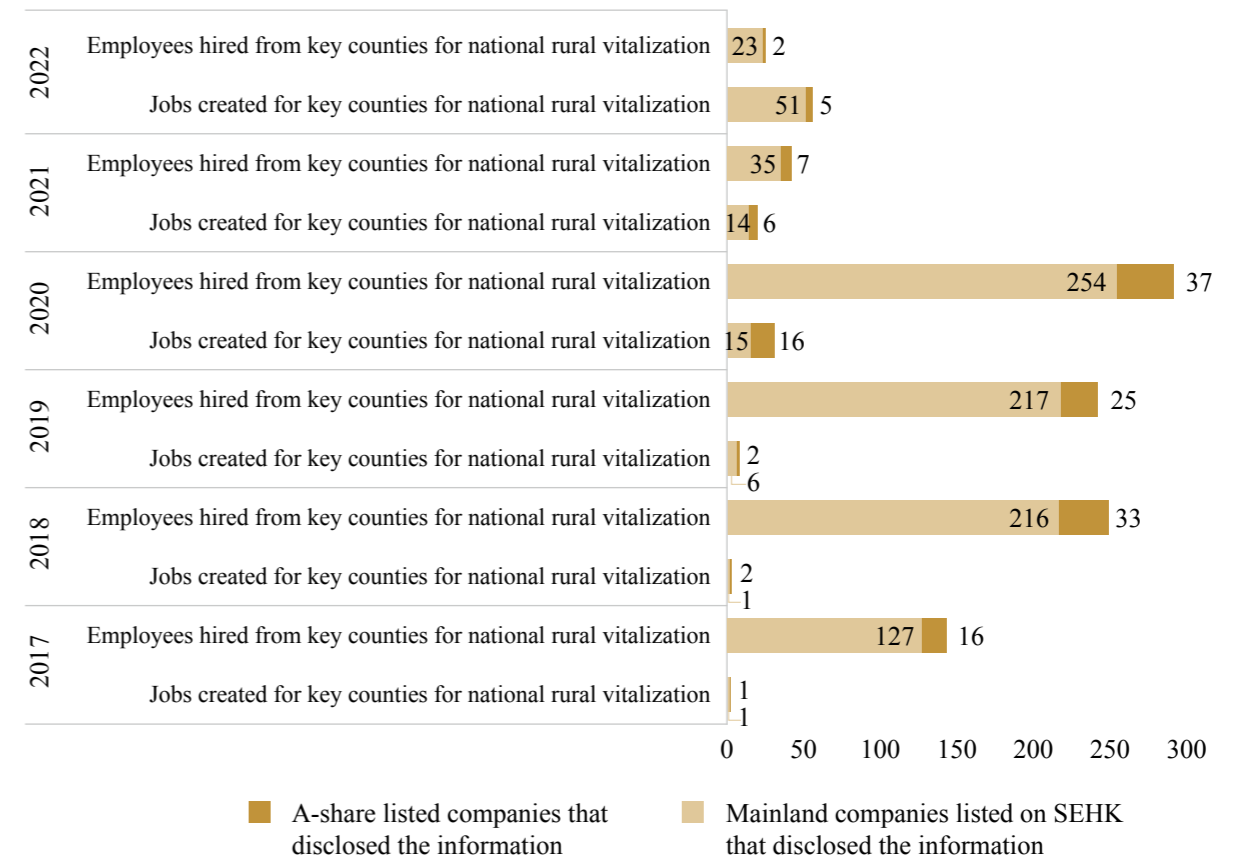


Figure 3-12 Number of listed companies disclosing contribution to rural vitalization

### 3.3 Quality analysis for ESG indicators of listed companies

ESG accounting relies on high-quality ESG data. This section evaluates the quality of ESG data disclosed by listed companies to ensure accurate ESG accounting.

#### 3.3.1 Analysis method and rating criteria

High-quality quantitative ESG data is the foundation of accurate ESG accounting. This report assesses and rates the quality of quantitative ESG data disclosed by listed companies in four aspects: consistency<sup>1</sup>, accuracy<sup>2</sup>, effectiveness<sup>3</sup>, and comparability<sup>4</sup>. The data from our database is classified into three grades: Grade A<sup>5</sup>, Grade B<sup>6</sup> and Grade C<sup>7</sup> (excellent, good and qualified).

#### 3.3.2 Quality analysis for ESG indicators

In line with the above-mentioned data quality rating standards, this report analyzes the quality of ESG indicators disclosed by 31 primary industries from 2017 to 2022, and saves qualified data for ESG accounting.

For instance, the quality of CO2 emissions data in 2022 is analyzed as below. Industries approaching or exceeding 50% of Grade-A rate include transportation, social services, banking, food & beverage, agriculture, forestry, animal husbandry, & fishery industries and coal. Industries approaching or exceeding 50% of Grade-B rate include basic chemical, national defense and military, environmental protection, power equipment, textile & apparel, computer and comprehensive industry.

Among key carbon emission reduction industries, the CO2 emissions disclosure rates among the petroleum & petrochemicals, public utility, transportation, building materials, iron & steel, non-ferrous metal and light manufacturing industry all surpass 50%. Specifically, the sum of CO2 emissions

1 The consistency refers to the assessment of whether the physical boundary of data sources aligns with that in the annual financial reports of listed companies.

2 The accuracy refers to determining the source and origin of the data, whether it is from the annual financial reports or ESG reports disclosed by companies, or from authoritative institutions or organizations.

3 The effectiveness refers to comparing the intensity value of indicators with the industry average when there are no significant changes in the disclosure scope of indicators.

4 The comparability refers to comparing the intensity value of indicators with the historical values of companies, when there are no significant changes in the disclosure scope of indicators.

5 Grade A (excellent) represents the highest data quality according to the criteria. To achieve Grade A, the data should meet all of the following conditions: the physical boundary of data sources aligns with that in the annual financial reports of listed companies; the data is from the annual financial reports or ESG reports disclosed by companies, or from authoritative institutions or organizations; when there are no significant changes in the disclosure scope of indicators, the differences between the intensity value of indicators and the industry average as well as the historical values of companies fall within an acceptable range.

6 Grade B (good) indicates strong alignment of the data with the criteria and its representativeness. To achieve Grade B, the data should meet at least three of the following conditions: the physical boundary of data sources aligns with that in the annual financial reports of listed companies; the data is from the annual financial reports or ESG reports disclosed by companies, or from authoritative institutions or organizations; when there are no significant changes in the disclosure scope of indicators, the difference between the intensity value of indicators and the industry average falls within an acceptable range; when there are no significant changes in the disclosure scope of indicators, the differences between the intensity value of indicators and the historical values of companies falls within an acceptable range.

7 Grade C (qualified) indicates basic alignment of the data with the criteria and it is qualified for ESG accounting. To achieve Grade C, the data should meet at least one of the following conditions: the physical boundary of data sources aligns with that in the annual financial reports of listed companies; the data is from the annual financial reports or ESG reports disclosed by companies, or from authoritative institutions or organizations; when there are no significant changes in the disclosure scope of indicators, the difference between the intensity value of indicators and the industry average falls within an acceptable range; when there are no significant changes in the disclosure scope of indicators, the differences between the intensity value of indicators and the historical values of companies falls within an acceptable range.

Grade-A rates and Grade-B rates among transportation, building materials and light manufacturing industry all exceeds 90% (Table 3-7).

Table 3-7 CO2 emissions disclosure rate and data quality of key carbon emission reduction industries in 2022

Primary industries	CO2 emissions disclosure rate	CO2 emissions Grade-A rate	CO2 emissions Grade-B rate	CO2 emissions Grade-C rate
Petroleum & petrochemicals	80.70%	34.78%	45.65%	19.57%
Building materials	69.23%	47.22%	44.44%	8.33%
Transportation	67.21%	51.22%	39.02%	9.76%
Non-ferrous metal	61.80%	30.91%	45.45%	23.64%
Iron & steel	60.42%	37.93%	41.38%	20.69%
Public utility	57.26%	29.85%	49.25%	20.90%
Light manufacturing industry	54.65%	44.68%	48.49%	6.38%
Basic chemical	32.47%	28.00%	52.00%	20.00%

The social services and banking are two high-performing service industries with high-level CO2 emissions data quality. The social services industry saw 60.38% of CO2 emissions Grade-A rate, 26.42% of Grade-B rate and 13.21% of Grade-C rate (Table 3-8). The banking industry witnessed 52.63% of CO2 emissions Grade-A rate, 42.11% of Grade-B rate and 5.26% of Grade-C rate (Table 3-8).

Table 3-8 CO2 emissions disclosure rate and data quality of service industries in 2022

Primary industries	CO2 emissions disclosure rate	CO2 emissions Grade-A rate	CO2 emissions Grade-B rate	CO2 emissions Grade-C rate
Non-banking financial	79.19%	32.85%	43.07%	24.09%
Banking	77.03%	52.63%	42.11%	5.26%
Social services	74.65%	60.38%	26.42%	13.21%
Commercial & retail	65.59%	26.23%	49.18%	24.59%
Media	40.45%	38.89%	38.89%	22.22%

Among other industries, the food & beverage, coal as well as agriculture, forestry, animal husbandry, and fishery industries also harvested high-level carbon emissions data quality, with CO2 emissions Grade-A rates approaching or surpassing 50%. Meanwhile, the CO2 emissions Grade-B rates in the comprehensive industry, environmental protection, pharmaceuticals & biologics, machinery and equipment, coal and national defense and military all reached 50% and or above. The CO2 emissions Grade-C rates among architectural ornament and electronics industries were above 25% (Table 3-9).

Table 3-9 CO2 emissions disclosure rate and data quality of other industries in 2022

Primary industries	CO2 emissions disclosure rate	CO2 emissions Grade-A rate	CO2 emissions Grade-B rate	CO2 emissions Grade-C rate
Cosmetics	77.14%	44.44%	44.44%	11.11%
Real estate	74.15%	29.61%	48.68%	21.71%
Communications	69.64%	38.46%	43.59%	17.95%
Textile & apparel	60.23%	32.08%	54.72%	13.21%
Pharmaceuticals & biologics	59.09%	41.26%	46.15%	12.59%
Automobile	54.62%	44.62%	44.62%	10.77%
Coal	54.55%	50.00%	33.33%	16.67%
Electronics	54.29%	26.32%	44.74%	28.95%
Food & beverage	52.22%	55.32%	29.79%	14.89%
Comprehensive industry	50.00%	33.33%	50.00%	16.67%
Architectural ornament	48.78%	37.50%	37.50%	25.00%
Computer	47.90%	23.75%	57.50%	18.75%
Environmental protection	47.83%	6.06%	69.70%	24.24%
Machinery and equipment	43.75%	42.86%	35.71%	21.43%
Electrical equipment	43.48%	30.00%	52.00%	18.00%
Household appliance	41.67%	46.67%	40.00%	13.33%
Agriculture, forestry, animal husbandry and fishery	28.57%	50.00%	28.57%	21.43%
Defense and military	18.60%	37.50%	50.00%	12.50%

## 4. ESG Value Accounting Report of Listed Companies



ESG value accounting is the latest and leading exploration of evaluating the ESG performance of companies, and the results are reflected in the net ESG value, ESG risk/opportunity value as well as other data of ESG statement. In this chapter, we take all A-share listed companies<sup>1</sup> from 2018 to 2022 as a sample to account for their ESG value.

Table 4-1 Number of companies covered in ESG value accounting

Market	2018	2019	2020	2021	2022
A-share	3477	3681	4117	4641	4976

## 4.1 Scope of Accounting

Scope: From 2018 to 2022

Sample: All A-share companies listed on the Shanghai, Shenzhen, and Beijing stock exchanges

Data source: Listed companies' independently disclosed ESG reports, social responsibility reports, sustainability reports, annual reports, and related announcements, with credible supplementary information from the government, China Securities Regulatory Commission, stock exchanges, corporate official websites, and mainstream media.

## 4.2 Net ESG Value Accounting Analysis of Listed Companies

The net ESG value of listed companies reflects the quantitative impact or contribution of listed companies to sustainable development in the environmental and social dimensions. It mainly accounts for carbon emissions, waste and pollutant discharge, resource utilization, gender equality, tax intensity, employee training, employee health and safety, contribution to common prosperity, and contribution to rural revitalization. ESG value accounting of listed companies promotes sustainable investing and companies' sustainable transformation and better integrates environmental protection, human rights, and social justice into decision-making.

### 4.2.1 Analysis of the net ESG value of listed companies

**The number of listed companies that produce positive net ESG impacts is on the rise each year.**

The net ESG value of listed companies is composed of two parts: environmental and social. From 2018 to 2022, the number of listed companies with positive net ESG values has shown an upward trajectory, indicating that an increasing number of companies are creating positive environmental and social externalities. The number of companies with positive net ESG values in 2022 increased by more than 300 from 2018 (see Figure 4-1).

<sup>1</sup> A-share listed companies include companies listed on the Shanghai Stock Exchange, Shenzhen Stock Exchange, and Beijing Stock Exchange in the current year. The list of A-share listed companies was exported from the Wind Economic Database in December 2022 for statistical analysis, excluding companies whose disclosure data failed to meet accounting requirements.

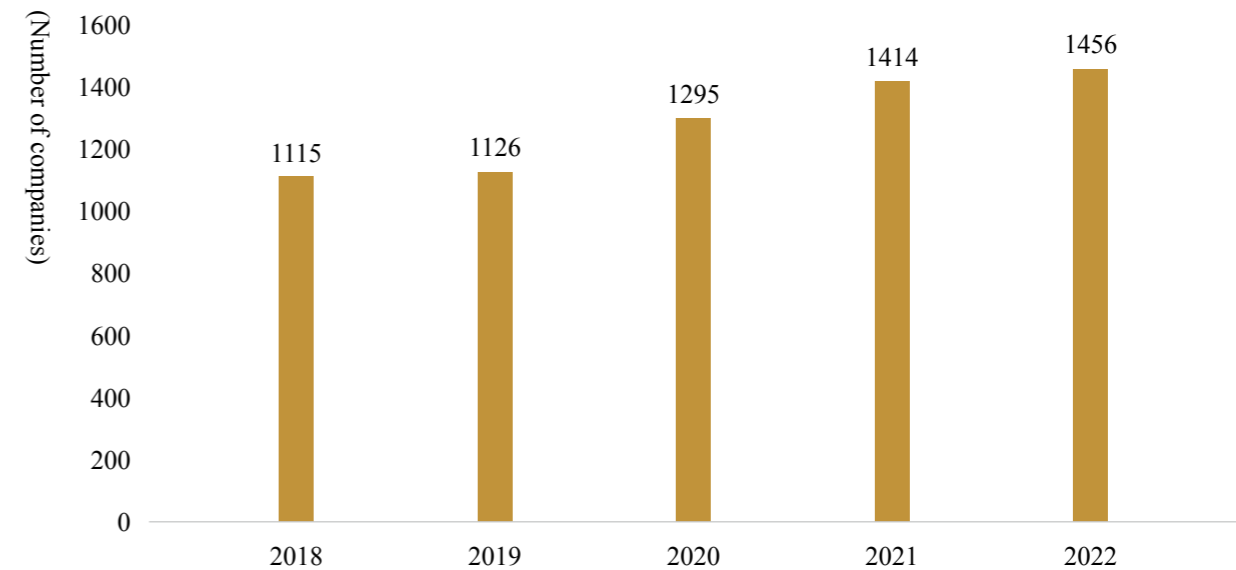


Figure 4-1 The number of companies that produce positive net ESG impacts is on the rise each year

**Major environmental indicators including emission intensity and resource use intensity show a downward trend, which suggests a significant improvement in environmental performance.**

Net environmental value accounting involves carbon emissions, waste and pollutant discharge, and resource utilization. It mainly accounts for the environmental impact of a company's resource consumption. Statistics indicate that the environmental performance of A-share listed companies has improved year by year, with carbon emissions, waste and pollutant discharge, and resource use per unit of revenue dropping dramatically (see Figure 4-2). Specifically, CO<sub>2</sub> emission intensity decreased from 1.02 tons/10,000 yuan in 2018 to 0.74 tons/10,000 yuan in 2022. Discharge intensity of general solid waste was reduced from 0.28 tons/10,000 yuan in 2018 to 0.24 tons/10,000 yuan in 2022. Discharge intensity of hazardous solid waste was lowered from 0.0026 tons/10,000 yuan in 2018 to 0.0025 tons/10,000 yuan in 2021. Fresh water consumption intensity decreased from 2.63 tons/10,000 yuan in 2018 to 2.21 tons/10,000 yuan in 2022. The decrease in intensity means that less CO<sub>2</sub> and waste are generated and fewer resources are consumed for every 10,000 yuan of revenue, with gradually improved negative net environmental impacts and stronger positive environmental externalities.

**The number of companies that produce more externalized social value for stakeholders is rising steadily each year.**

Net social value accounting involves gender equality, employee health and safety, employee training, tax intensity, contribution to common prosperity, and contribution to rural vitalization. From 2018 to 2022, the number of listed companies with positive social value increased year by year (see Figure 4-3), with a relatively stable proportion of about 60%. In 2022, the number of companies with positive net social value grew by nearly 700 from 2018.

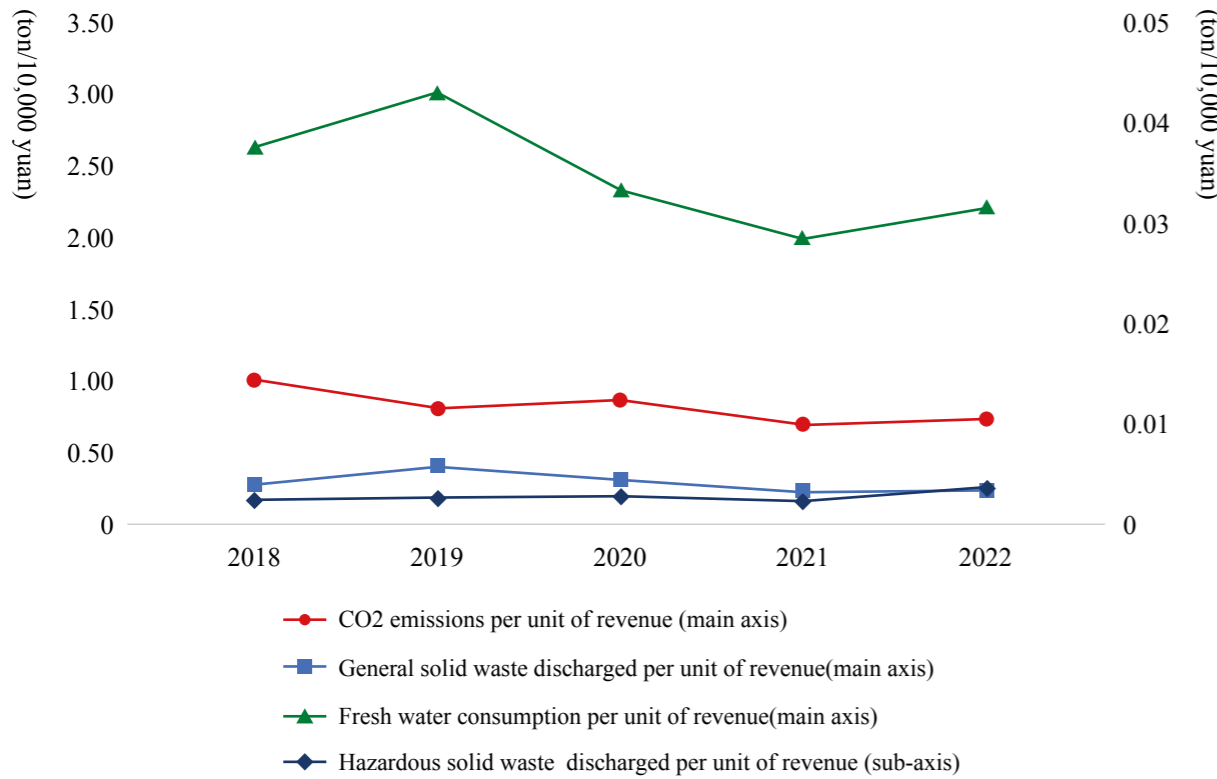


Figure 4-2 The emission and discharge intensity and resource use intensity of major environmental indicators continue to decrease

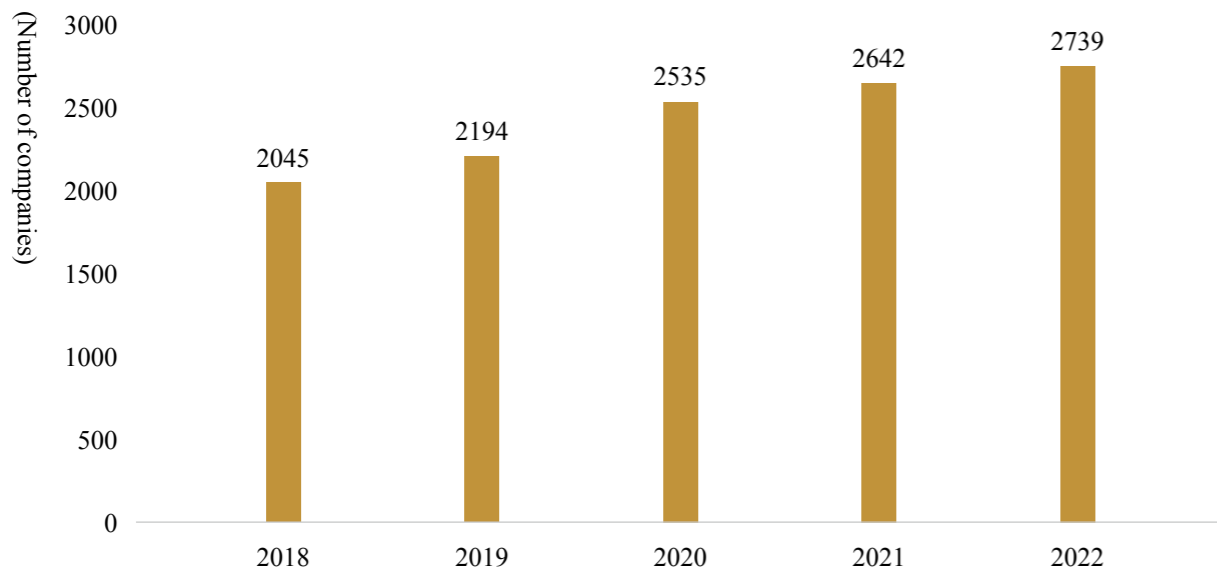


Figure 4-3 The number of companies that have positive net impacts on stakeholders is on the rise each year

#### 4.2.2 Net environmental value analysis

The CO2 emission intensity of key industries required for carbon reduction has witnessed a noticeable decrease. The impact of direct and indirect CO2 emissions on the environment is considered in CO2 emission accounting. Based on the CO2 emissions disclosed by companies, we calculate their CO2 emission intensity per unit of revenue. In total, eight key industries required for carbon reduction are analyzed. Compared with the data in 2018, of the eight key industries, the transportation, public utility, and building materials industries registered lower CO2 emission intensity. The largest decline was shown in the public utility industry, from 24.84 tons/10,000 yuan in 2018 to 9.43 tons/10,000 yuan in 2022 (see Figure 4-4). The reduction in CO2 emission intensity means that these industries took measures to control and reduce carbon emissions, achieving remarkable results. From 2018 to 2022, nearly 100 listed companies disclosed the area of afforestation and the amount of CCUS. Some companies even disclosed such data for years in a row, indicating that companies were increasingly keen to disclose indicators related to carbon control and reduction.

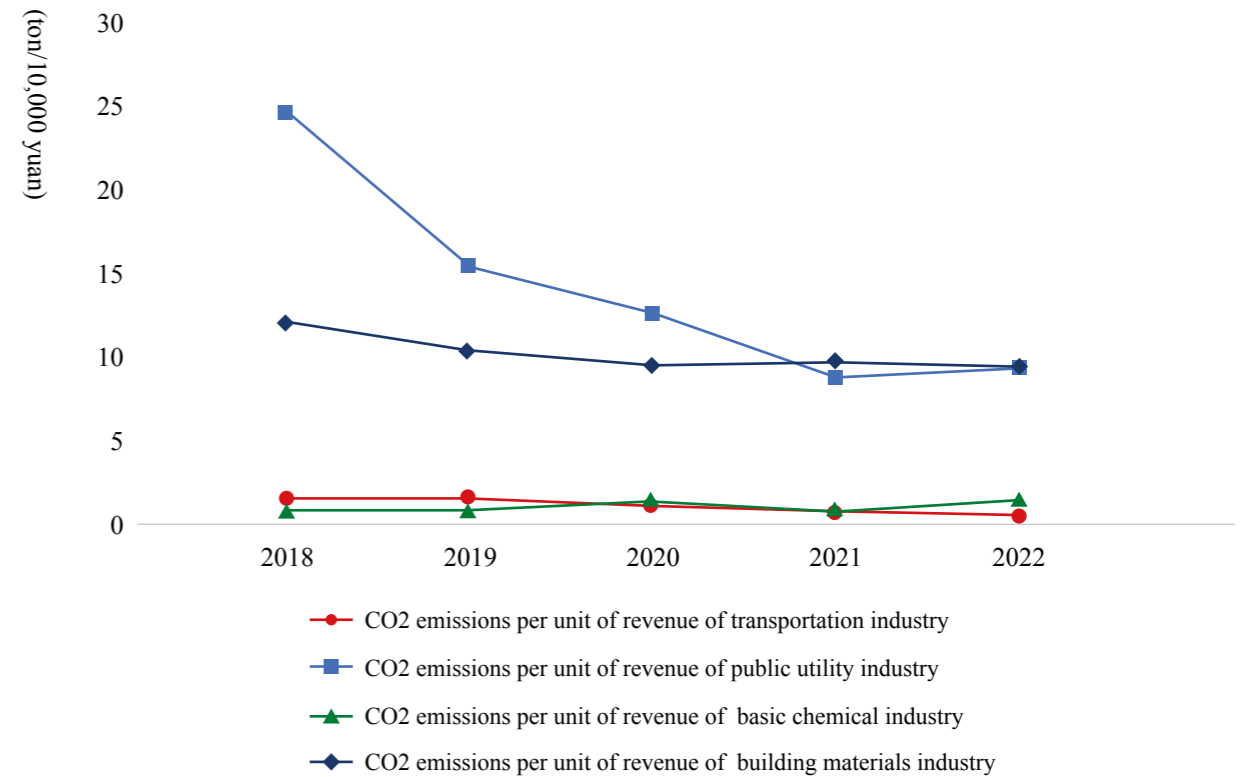


Figure 4-4 CO2 emissions per unit of revenue of key industries for carbon reduction<sup>1</sup>

<sup>1</sup> Take the transportation, public utility, basic chemical, and building materials industries for example

**The waste intensity of the public utility, basic chemical, and environmental protection industries has seen a notable reduction.** The environmental impacts of general solid waste, hazardous solid waste, gaseous pollutants, liquid pollutants, etc. in the production process of companies are included in the waste and pollutant discharge accounting. We focus on the disclosed amount of general solid waste, hazardous solid waste, and gaseous and liquid pollutants per unit of revenue. For example, when it comes to solid waste (see Figure 4-5), compared with data in 2018, industries that registered lower waste intensity, or fewer general solid waste per 10,000 yuan of revenue were the public utility, basic chemical, and environmental protection industries, among which the environmental protection industry had the most remarkable decline, from 2.94 tons/10,000 yuan in 2018 to 0.86 tons/10,000 yuan in 2022. Compared with data in 2018, industries that registered lower waste intensity, or fewer hazardous solid waste per 10,000 yuan of revenue were the agriculture, forestry, animal husbandry and fishery, building materials, as well as machinery and equipment industries, among which the building materials industry documented the largest decline, from 0.09 tons/10,000 yuan in 2018 to 0.0006 tons/10,000 yuan in 2022.

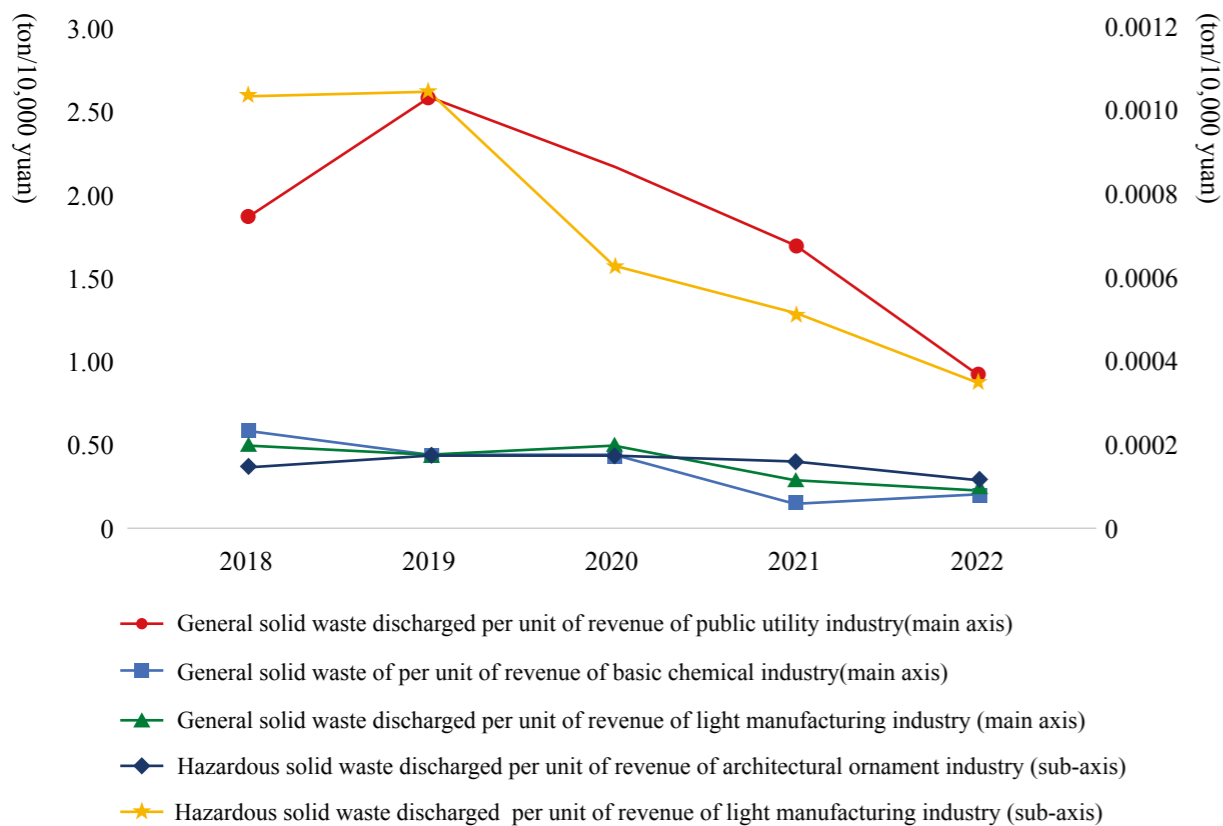


Figure 4-5 Solid waste discharged per unit of revenue<sup>1</sup>

<sup>1</sup> The general solid waste indicator takes data from the public utility, basic chemical, and light manufacturing industry and the hazardous solid waste indicator takes data from the architectural ornament as well as light manufacturing industries.

**The resource use intensity in pharmaceuticals & biologics, public utility, and textile and apparel industries has shown a considerable drop.** The environmental impact of various resources used by companies is accounted for, including the quantity of water used, raw materials recycled, and non-renewable resources purchased. We calculate the consumption intensity of companies based on their disclosed fresh water consumption. Compared with the data in 2018, industries with lower fresh water consumption per 10,000 yuan of revenue included the pharmaceuticals & biologics, public utility, and textile and apparel industries, among which the public utility industry witnessed the largest decrease, from 26.50 tons/10,000 yuan in 2018 to 10.98 tons/10,000 yuan in 2022 (see Figure 4-6). Lower fresh water consumption intensity suggests that these industries took effective measures to control the use of water and reduce water waste, with practical results achieved. From 2018 to 2022, nearly 150 listed companies disclosed the amount of water recycled. Some even disclosed such data for many years in a row. Some companies made clear the amount of recycled steel, iron, and other metals, as well as the amount of recycled paper, packaging materials, and construction waste.

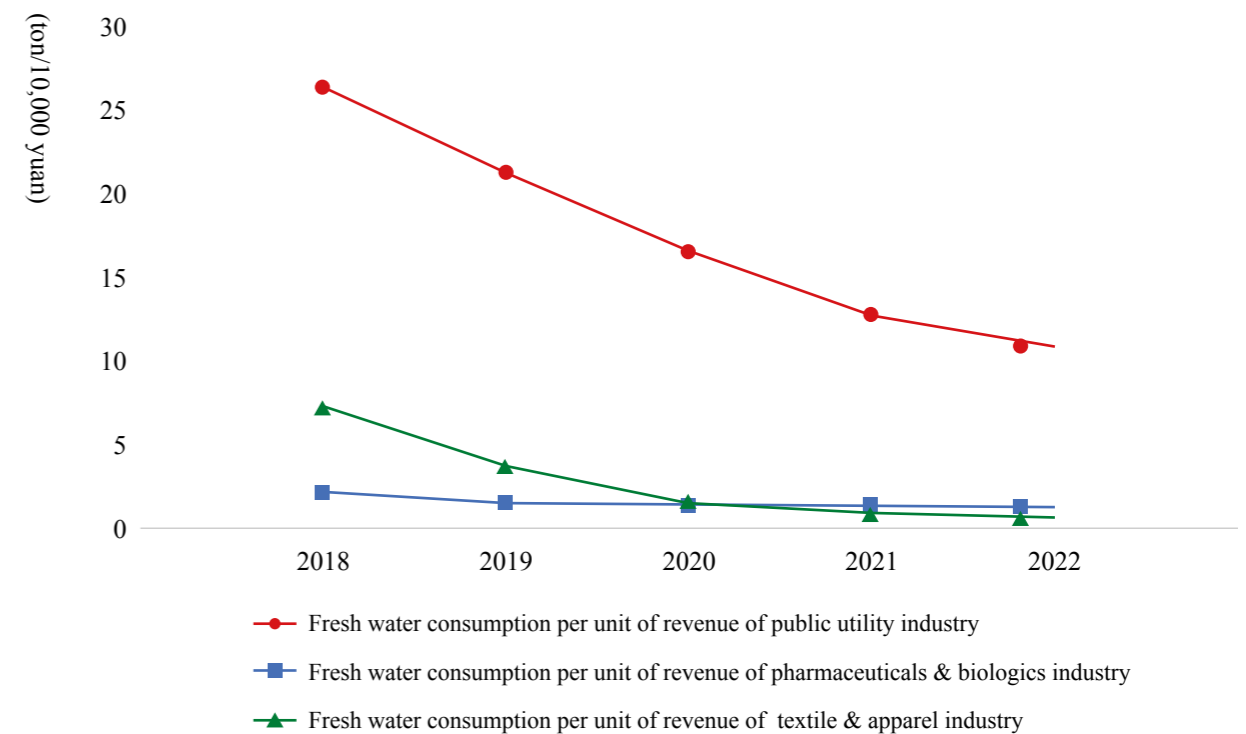


Figure 4-6 Fresh water consumption per unit of revenue<sup>1</sup>

<sup>1</sup> Take the public utility, pharmaceuticals and biologics, and textile and apparel industries as examples.

Industry-specific indicators exist for industries with unique ESG values. The banking and clean energy industries have positive environmental externalities by promoting green finance and environmental protection. Such environmental values are calculated by accounting for the net value of green finance and the net value of carbon reduction from clean energy generation.

**The banking industry has obtained significant benefits in reducing emissions through green finance.** The banking industry is an important player in implementing green finance policies in China. In 2016, seven ministries and commissions, including the People's Bank of China, issued the Guiding Opinions on Building a Green Financial System, requiring the banking industry to leverage financial tools such as green credit, green bonds, green stock indexes, and relevant policies to support a green economy. In 2021, the People's Bank of China formulated the Green Finance Assessment Plan for Banking Financial Institutions, which was intended to urge the financial institutions in banking industry to adjust their credit structure through green finance, improve the professionalism of green industries, and strengthen green credit capacity building. In 2022, the former China Banking and Insurance Regulatory Commission issued the Green Finance Guidelines for Banking and Insurance Sectors, requiring the banking industry to integrate ESG requirements into its credit business and strengthen the management of ESG risks and opportunities. Green finance is an important and unique indicator of the banking industry.

The net value of green finance is calculated by multiplying the annual carbon reduction equivalent of green loans by the marginal cost of carbon reduction. Since the value created by companies in green finance is conditioned by size factors such as revenue, it is necessary to analyze the total green finance value and the value per unit of revenue. From 2018 to 2022, the sum of the net value of green finance in the banking industry displayed an upward trend, and the net value of green finance per unit of revenue also continued to rise (see Figure 4-7), indicating that the banking industry intensified efforts in green and low-carbon development.

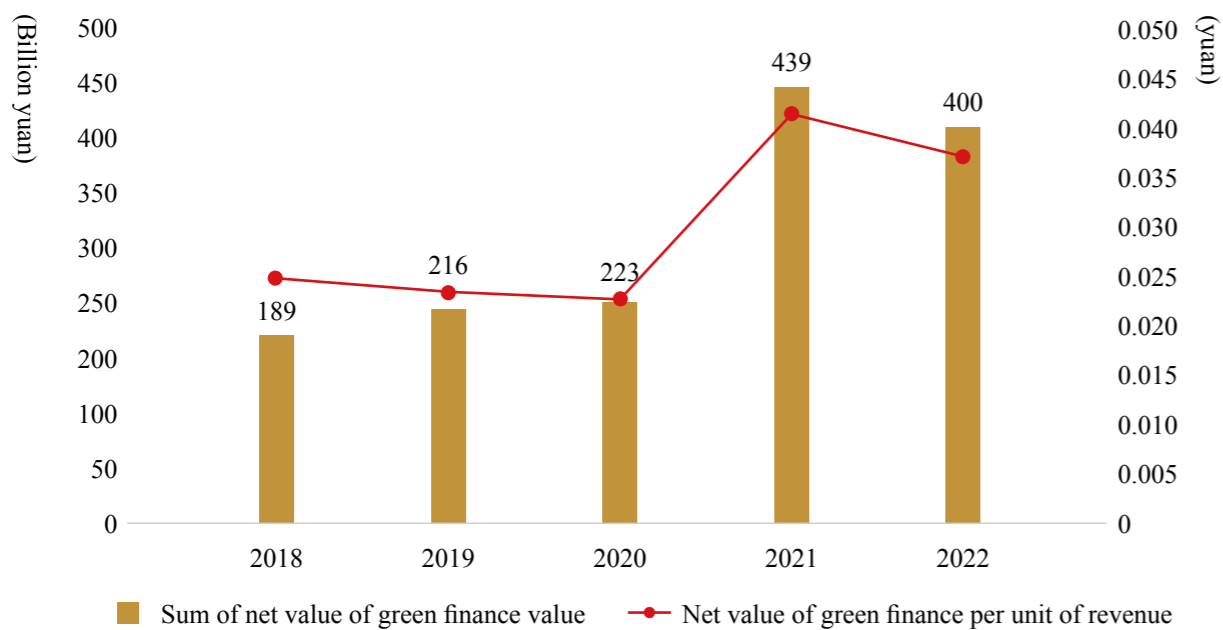


Figure 4-7 Sum of net value of green finance value & the net value of green finance per unit of revenue

**Clean energy that replaces conventional energy in power generation contributes to noteworthy carbon reduction benefits.** In November 2021, the People's Bank of China, together with the National Development and Reform Commission (NDRC) and the Ministry of Ecology and Environment, developed a monetary policy tool for carbon reduction and showed unequivocal support for three key carbon reduction sectors: clean energy, energy conservation and environmental protection, and carbon reduction technologies. As of June 2023, the balance of the carbon reduction monetary policy tool was 453 billion yuan, and special re-loans to support the clean and efficient use of coal held a balance of 245.9 billion yuan. On August 15, 2023, the NDRC released the important results on the third anniversary of China's major declaration to peak carbon dioxide emissions and achieve carbon neutrality. China has put in place a top-down "1+N" policy system for carbon peaking and carbon neutrality and emphasized the development of new energy and clean energy. In terms of the clean use of coal, more than 520 GW of coal-fired power units have been transformed to save energy, reduce carbon, enhance flexibility, and improve heating, and the installed capacity of renewable energy has exceeded 1.3 TW, surpassing that of coal-fired power for the first time.

The value of environmental protection is an industry-specific indicator for clean energy power generation. Usually, the value of carbon reduction is calculated by multiplying the amount of carbon reduced through clean power generation by the marginal cost of carbon reduction. Since the value of carbon reduction in clean energy power generation is conditioned by size factors such as corporate revenue, it is necessary to calculate the total value of carbon reduction and the value per unit of revenue. From 2018 to 2022, the net value of carbon reduction in the clean energy sector reflected a steady ascent. The net value of carbon reduction per unit of clean energy revenue first rose and then stabilized (see Figure 4-8), indicating that companies attached more importance to the use of clean energy such as wind power, hydropower, and solar energy and accelerated the replacement of conventional energy.

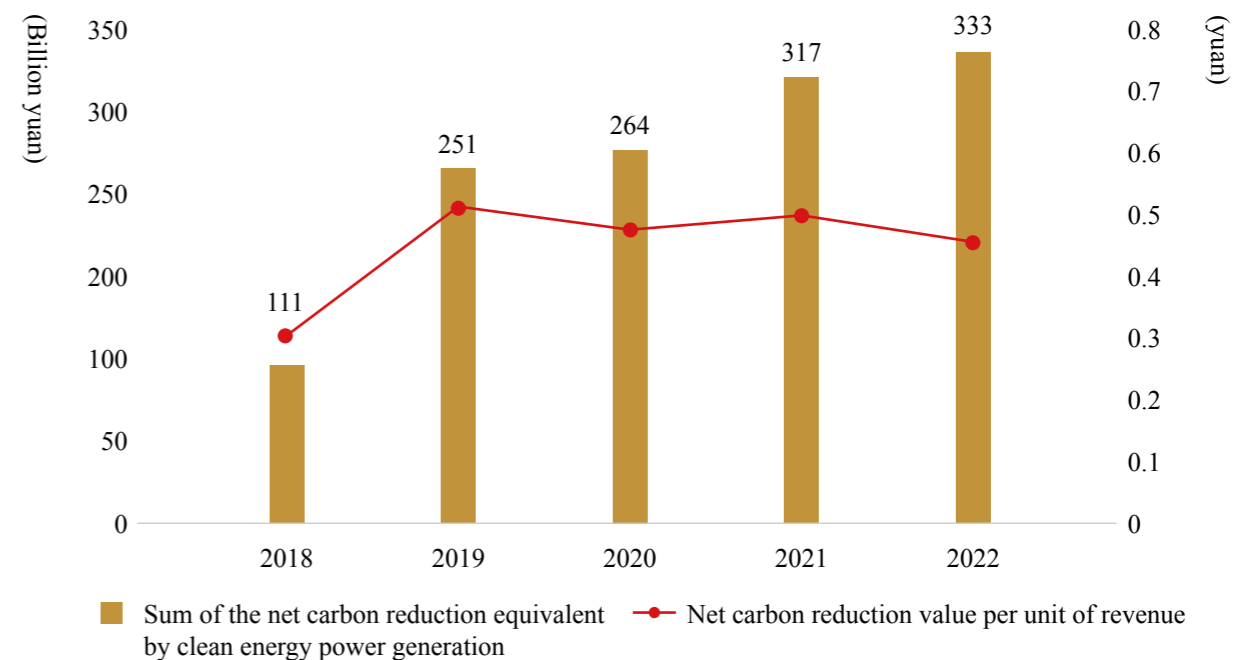


Figure 4-8 Sum of the net carbon reduction equivalent by clean energy power generation & the net carbon reduction value per unit of revenue

### 4.2.3 Net social value analysis

**Contributions are made to the employment and rights protection of female employees.** Gender equality accounts for the additional cost borne by companies in more employment of women and more paid leaves for childbirth and childcare. Gender equality is usually measured by the proportion of female employees. We look at companies' disclosed data about the proportion of female employees and total salaries, combined with the monetization factor, to calculate the value of gender equality, which is conditioned by size factors such as the number of employees. We calculate both total and per capita gender equality values. From 2019 to 2022, total and per capita gender equality values were on the rise, and the total gender equality value in 2022 increased by more than 10 billion yuan from 2019, with per capita gender equality value up by more than 260 yuan from 2019. This means that listed companies contributed to the basic rights and interests of female employees and childbirth (see Figure 4-9). Compared with 2018, the banking industry witnessed the largest growth of nearly 4 billion yuan in total gender equality values in 2022 and the biggest per capita value increase of more than 1,000 yuan in 2022 from 2018. The per capita gender equality value in petroleum& petrochemicals, cosmetics, and banking industries improved for four consecutive years.

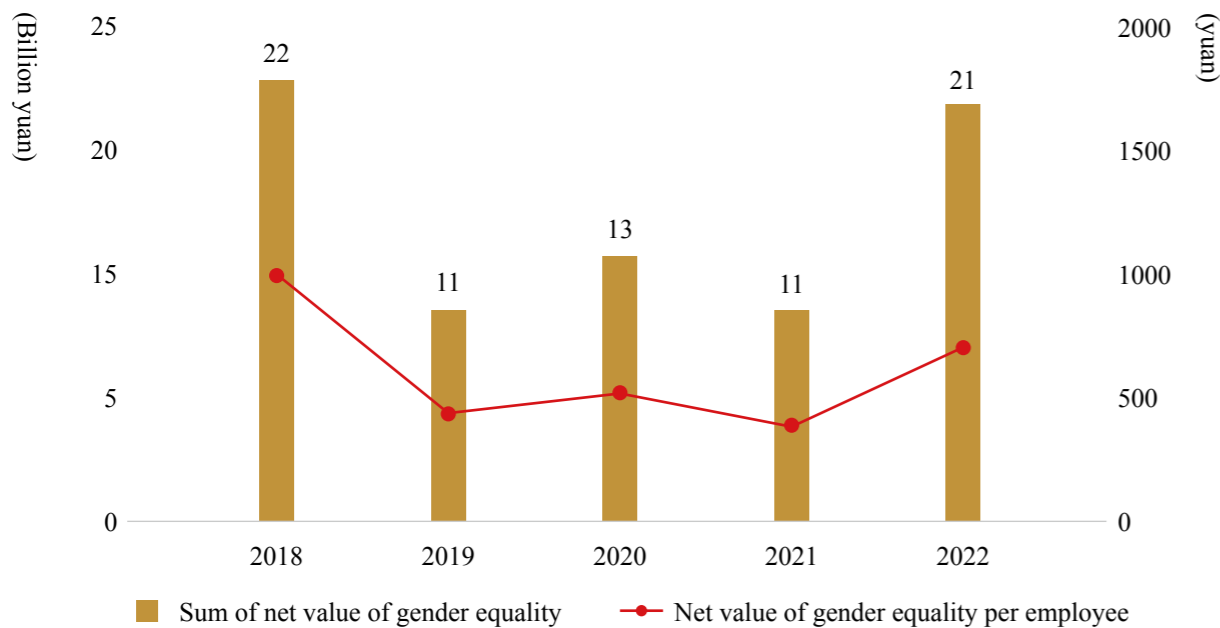


Figure 4-9 Sum of net value of gender equality & the net value of gender equality per employee

**Companies contribute to state taxation and social well-being.** Tax intensity accounts for the difference between the tax payment per unit of revenue of a company and the industry average to assess its tax contribution. We calculate the tax contribution value of a company based on its disclosed tax payment, but the value is influenced by size factors such as revenue. Both the total tax contribution value and the value per unit of revenue are analyzed. Compared with the data in 2018, the total value of tax contribution by the communications industry increased the most, or nearly 7 billion yuan, with the biggest growth in tax contribution value per unit of revenue.

**Training is strengthened to help increase human capital.** Employee training accounts for the career development value created by company-offered vocational training for employees. The disclosed employee training hours, together with the monetization factor, help determine the value of employee training, which is affected by size factors such as the number of employees. We pick out the total value of employee training and the value of training hours per employee for analysis. Overall, the total value of employee training in listed companies showed an upward trend, while the value of training hours per employee first increased and then stabilized (see Figure 4-10). Compared with the data in 2018, the total value of employee training in 2022 climbed by nearly 25 billion yuan, with the value of training hours per employee up by more than 600 yuan. Similarly, in the same period, the non-banking financial sector registered the largest increase of more than 4.5 billion yuan in the total value of employee training. The basic chemical industry secured the largest growth in the value of training hours per employee of over 1,000 yuan in 2022 from 2018. The value of training hours per employee in the basic chemical, non-ferrous metals, and automotive industries grew for four consecutive years.

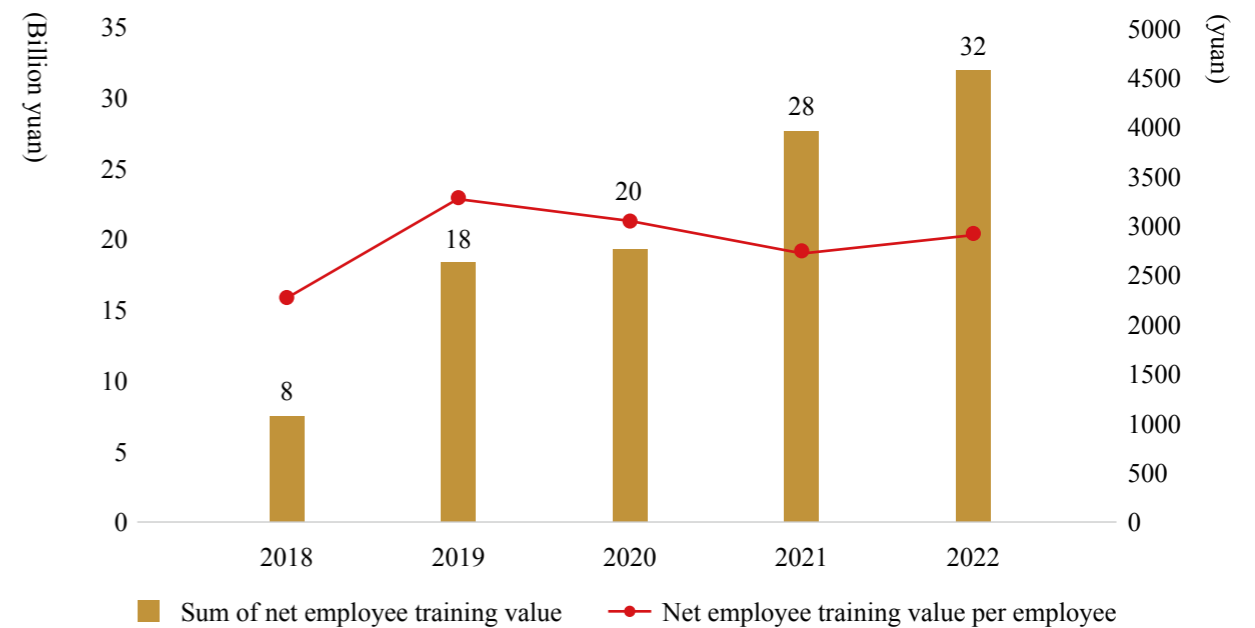


Figure 4-10 Sum of net employee training value & the net training value per employee

**More investment is channeled to health and safety to effectively prevent health and safety risks;** The value of employee health and safety is calculated monetarily by subtracting the negative impact of a company's work-related fatalities or injuries from its health and safety investments. The disclosed data on a company's health and safety investments and work-related fatalities, together with the monetization factor, determines the employee health and safety value, which is conditioned by the number of employees and other size factors. Our analyses are based on the total and per capita health and safety values of companies. Overall, both total and per capita values of employee health and safety demonstrated steady growth (see Figure 4-11). Compared with the data in 2018, the total value of employee health and safety in the architectural ornament industry experienced the largest increase of nearly 60 billion yuan. The industry had higher health and safety inputs and fewer days lost due to work-related fatalities or injuries. The computer industry recorded the largest increase in the per capita health and safety value of employees, or more than 4,000 yuan in 2022 from 2018. In the public utility, non-ferrous metals, and coal industries, the per capita employee health and safety value rose for four consecutive years.

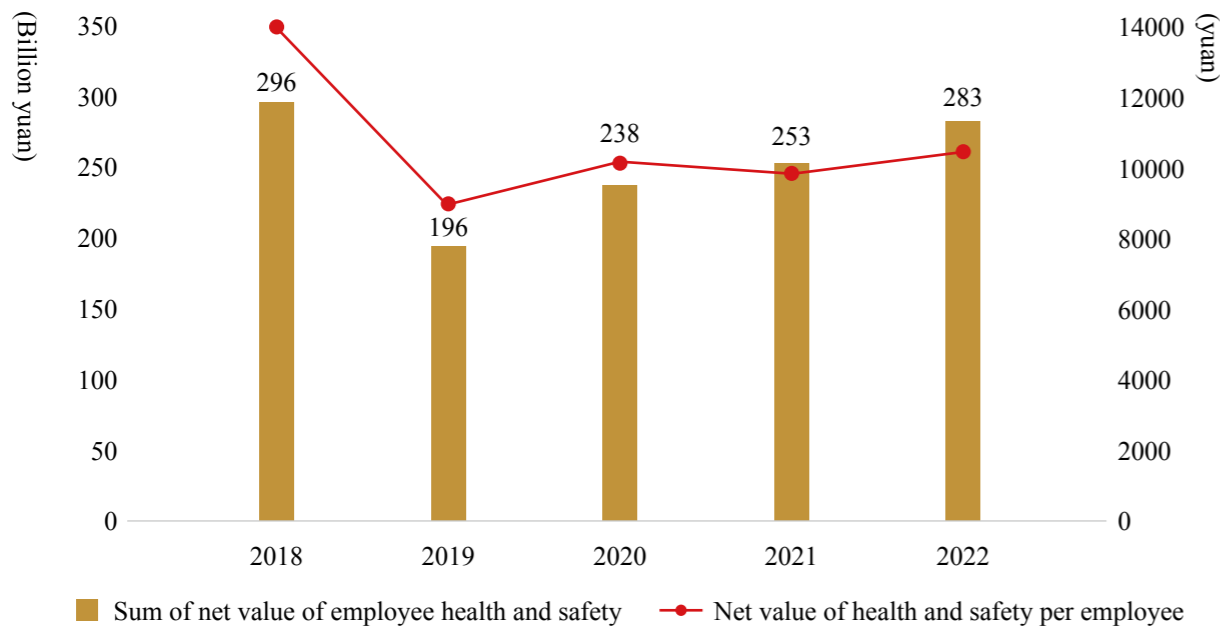


Figure 4-11 Sum of net value of employee health and safety & the net value of health and safety per employee

**More spending are channeled to charity to improve people's life.** Contribution to common prosperity calculates the value of charitable spending' positive externalities by combining companies' various types of spending with the corresponding monetization factor. Specifically, indicators disclosed by companies such as spending on education, rural vitalization, and charity are multiplied by the monetization factor to reach the value of charity, which is affected by size factors such as revenue. Our analyses cover both the total value of charity and the value per unit of revenue. Compared with the data in 2018, the total value of charity in the non-banking financial sector documented the biggest increase of more than 35 million yuan, suggesting that listed companies placed more emphasis on spending on education, public health, infrastructure, rural vitalization, and other causes. The largest increase in the value of charity per unit of revenue appeared in the national defense and military sector.

**Support is given to rural vitalization, industrial development, and employment.** The positive externality net value of contribution to rural vitalization is calculated by multiplying a company's number of employees and the company-supported employments in key counties of rural vitalization by the corresponding monetization factor. Since the value is influenced by size factors such as revenue, the total value created by companies in rural vitalization and the value per unit of revenue are analyzed. Overall, the total value created by companies in rural vitalization increased steadily each year, and the value of rural vitalization per unit of revenue first improved and then stabilized (see Figure 4-12). Compared with the data in 2018, the total value of rural vitalization in 2022 rose by nearly 25 billion yuan, while the value per unit of revenue went up by more than 600 yuan. In the same period, the largest increase in the total value of rural vitalization and the value per unit of revenue occurred in the national defense and military industry, and the value of rural vitalization per unit revenue of the light manufacturing industry grew for five consecutive years. This means that these industries placed more emphasis on employing people in key counties of rural vitalization and assisting them in getting employed.

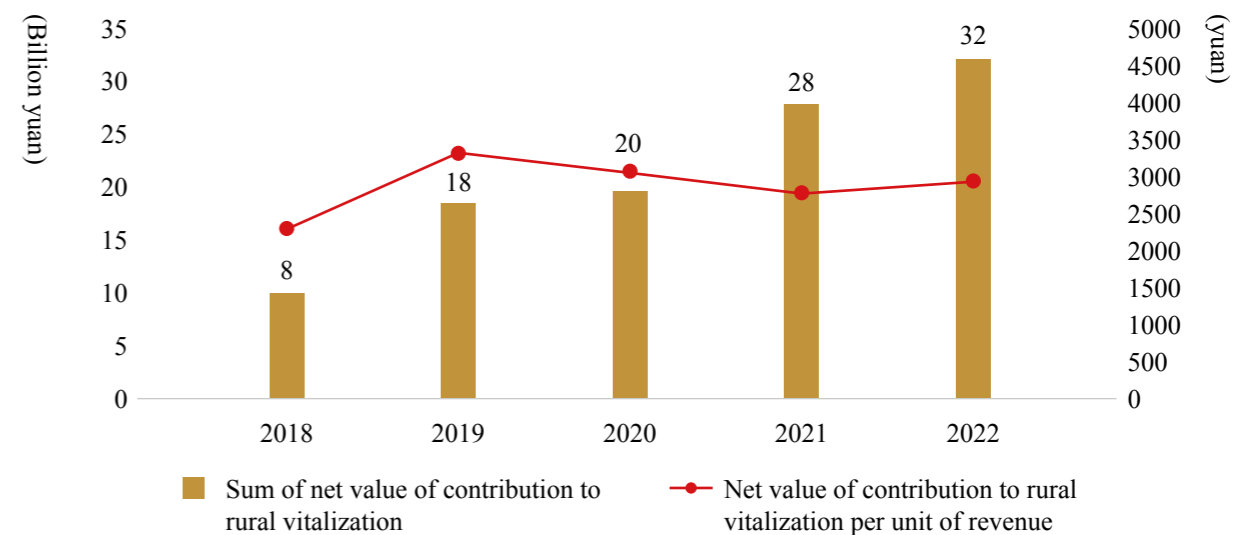


Figure 4-12 Sum of net value of contribution to rural vitalization & the net value of contribution to rural vitalization per unit of revenue

In addition, the social value of the banking industry includes the positive impact brought by the development of inclusive financial services to advance social progress. The social value of the gaming industry covers indicators such as the protection of minors and the prevention of addiction. Specifically, the accounting quantifies indicators such as the cost of online game addiction and the cost of myopia treatment to reflect the negative impact of the gaming sector on underage consumers.

**The banking industry vigorously develops inclusive finance and provides financial support for the development of micro and small enterprises (MSEs) and agricultural companies.** At the end of 2015, the State Council issued the *Plan for Promoting the Development of Inclusive Finance (2016-2020)*, which set out the direction of inclusive finance. In 2017, the former China Banking and Insurance Regulatory Commission, together with multiple departments, jointly released the *Implementation Plan for the Establishment of Inclusive Finance Divisions by Large and Medium-sized Commercial Banks* to urge large and medium-sized commercial banks to build inclusive finance divisions and improve services on MSEs and issues related to agriculture, rural areas, and farmers. In April 2022, the former China Banking and Insurance Regulatory Commission circulated the *Notice on Further Strengthening Financial Support for the Development of Small and Micro-sized Enterprises*. The document requires that financial services for MSEs should be deepened and the proportion of credit loans in the balance of inclusive loans to MSEs should be improved. These policies guide the rapid development of inclusive finance in the banking sector and encourage banks to provide credit support for MSEs and agricultural companies, so inclusive finance is regarded as an important indicator of the banking industry.

The net value of inclusive finance is calculated by multiplying the difference between the average financing cost and the interest rate of inclusive loans by the balance of inclusive loans announced by the former China Banking and Insurance Regulatory Commission. From 2018 to 2022, in terms of the banking's inclusive finance, the sum of net value of inclusive finance and the net value per unit revenue showed year-on-year increases (see Figure 4-13), indicating that the banking industry explored the development of inclusive finance and provided appropriate and effective financial services to MSEs and agricultural groups, thus contributing to rural vitalization and the development of SMEs.

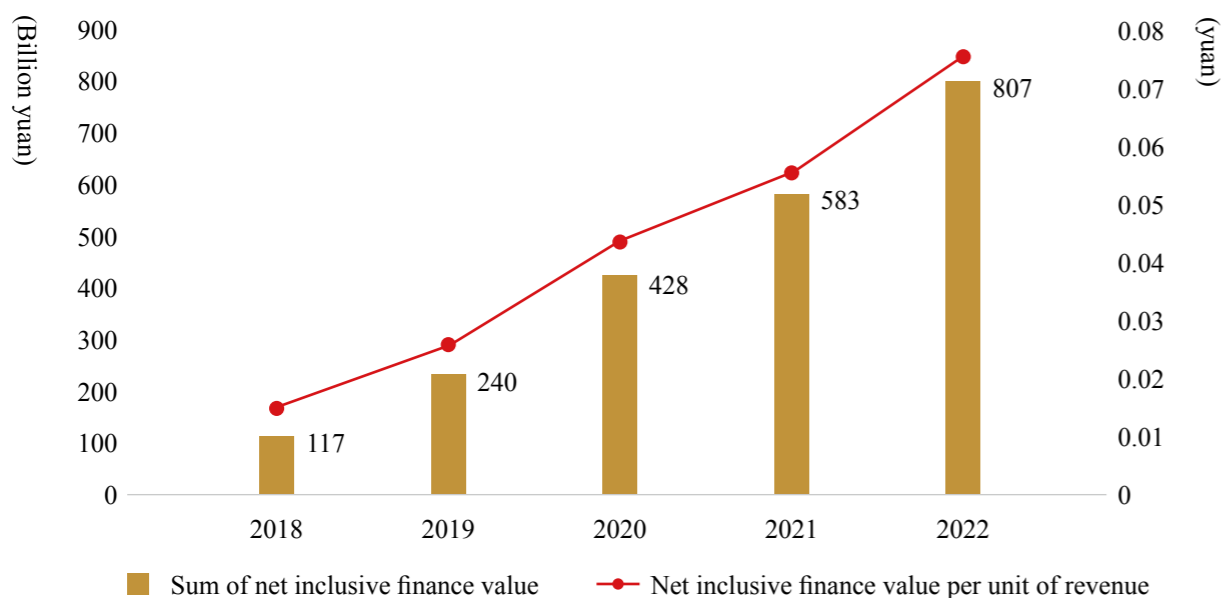


Figure 4-13 Sum of net inclusive finance value & the net inclusive finance value per unit of revenue

**The gaming industry has better performance in the protection of minors.** On August 30, 2018, eight ministries including the Ministry of Education issued a notice on the *Implementation Plan for the Comprehensive Prevention and Control of Myopia among Children and Adolescents*, proposing several plans for the prevention and control of myopia among minors. Measures such as controlling the number of online games and new games and limiting the gaming time of minors helped explore an age-appropriate reminder system that suited the realities in China. When it comes to the protection of minors and the prevention of addiction, we consider quantitative indicators such as the cost of gaming addiction and the cost of myopia treatment to reflect the impact of the gaming industry on underage consumers. The cost of gaming addiction is calculated by multiplying the number of users, the addiction rate, and the average loss of gaming addiction. The cost of myopia treatment is determined by multiplying the number of underage gamers, the rate of gaming-induced myopia among minors, and the average treatment cost of myopia. Compared with the data in 2018, the sum of the net value of minor protection and anti-addiction and the net value per unit of revenue both improved (see Figure 4-14), indicating that companies achieved remarkable results in preventing the negative impact on underage consumers. The negative impact of gaming on underage consumers in 2021 was noticeable, which was possibly due to the social distancing measures caused by the COVID-19 control.

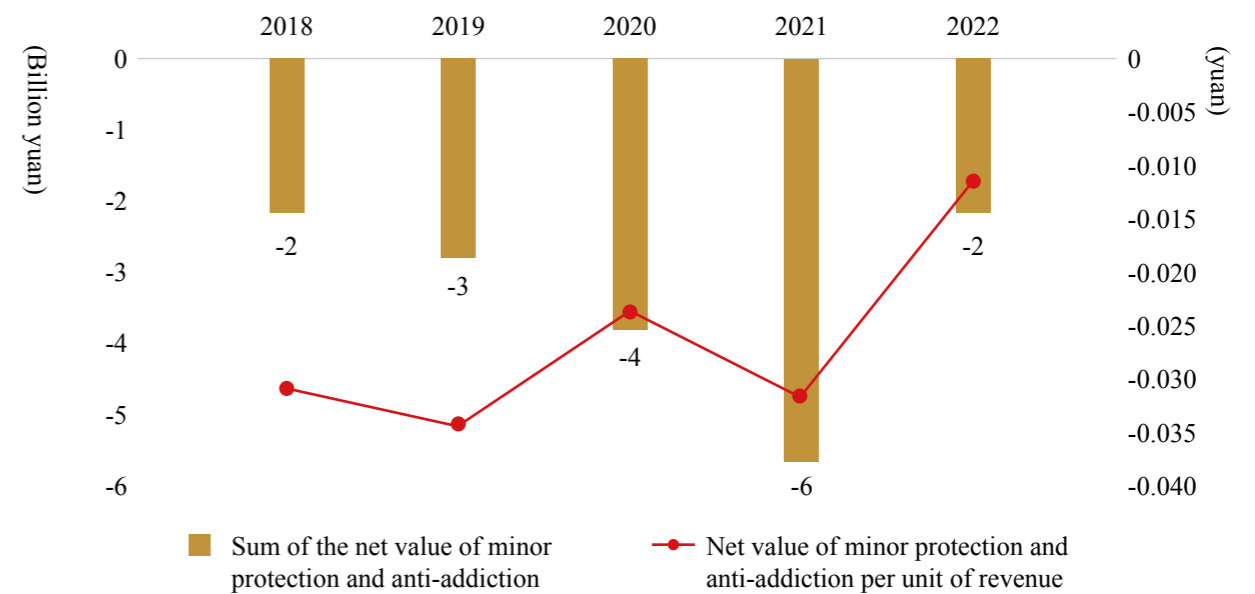


Figure 4-14 Sum of the net value of minor protection and anti-addiction & the net value of minor protection and anti-addiction per unit of revenue

### 4.3 ESG Risk/Opportunity Value Accounting Analysis of Listed Companies

ESG risk/opportunity value is calculated by comparing a company's net ESG value with the industry average. If the result is a positive number, it suggests that the company is above the industry benchmark and experiences opportunity emergence. On the other hand, a negative number means that the company is below the industry benchmark and faces risk exposure.

#### 4.3.1 Overall analysis of ESG risk/opportunity value of listed companies

**More than half of listed companies embrace ESG opportunity values.** The ESG risk/opportunity value of listed companies is composed of two parts: environmental risk/opportunity value and social risk/opportunity value, reflecting the performance of a company environmentally and socially. The ESG risk/opportunity value may weigh on a company's financial performance and valuation in the future. A positive ESG risk/opportunity value indicates that the company outperforms its counterparts in ESG value creation at the current stage and its excellent ESG level may contribute to better financial performance in the future. On the other hand, a negative ESG risk/opportunity value means that the company lags behind its competitors in ESG value creation at the current stage and its relatively weak ESG level may lead to a decline in future financial performance. From 2018 to 2022, more than half of the listed companies experienced opportunity emergence in ESG, environmental, and social topics (see Figure 4-15). About half of the listed companies excel in ESG value creation in their industries and are regarded as valuable investment targets.

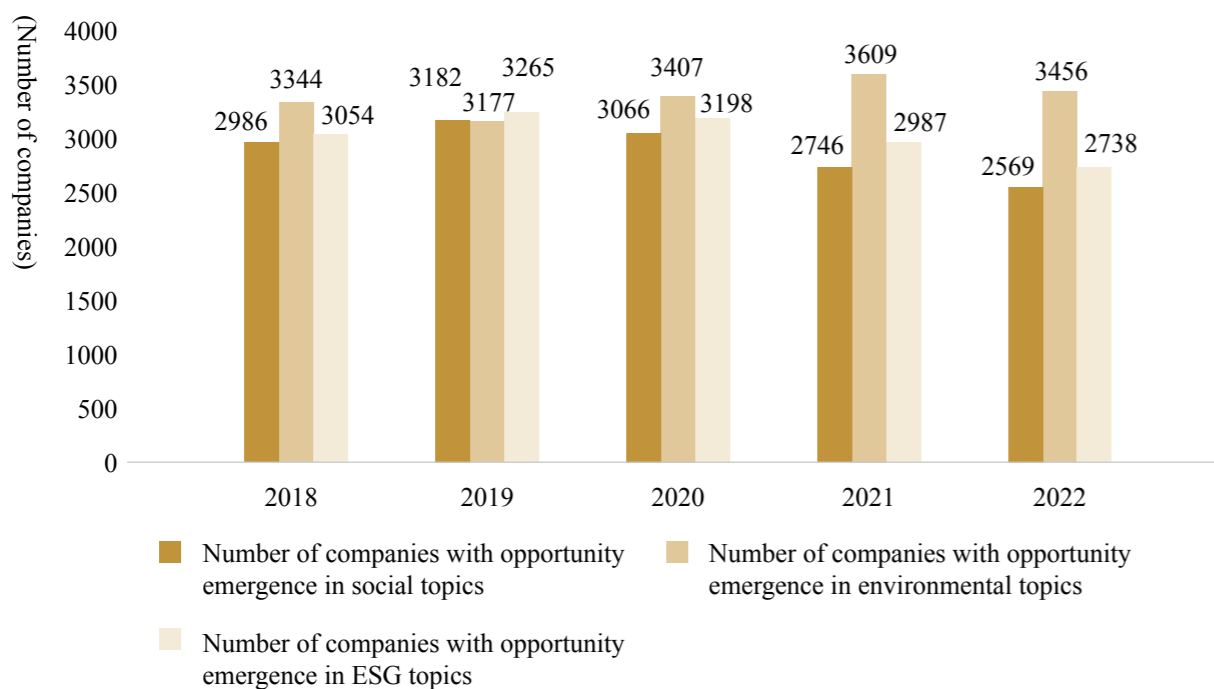


Figure 4-15 Number of listed companies with opportunity emergence

**Nearly half of the listed companies have environmental opportunity values.** From 2018 to 2022, about 50% of the listed companies experienced opportunity emergence in environmental issues such as carbon emissions, waste and pollutant discharge, and resource utilization. The proportion of companies with opportunity emergence for carbon emissions fluctuated around 50%, the proportion of companies with opportunity emergence for waste and pollutant discharge stood slightly higher than 50%, and the proportion of companies with opportunity emergence for resource utilization remained slightly less than 50%.

**Half of the listed companies report social values in areas such as gender equality, health and safety, etc.** From 2018 to 2022, the proportion of companies with opportunity emergence for gender equality and tax intensity fluctuated around 50%, and the proportion of companies with opportunity emergence for employee health and safety stabilized at about 40%. Changes in the proportion of companies with opportunity emergence for employee training, common prosperity, and rural vitalization remained within 5%.

#### 4.3.2 ESG risk/opportunity value analysis: a case study of the iron and steel industry

Risk exposures and opportunities vary by industry, so the ESG risk/opportunity values of different industries are less comparable. This chapter takes the iron and steel industry as an example.

We assess 45 A-share listed steel companies. Based on the ESG data of these companies from 2018 to 2022, we make a quantitative analysis of their ESG results to help them better apply accounting results and provide a framework for investors to evaluate corporate ESG performance.

**More than half of listed steel companies have ESG opportunities.** It is found that the overall ESG risk/opportunity value range of the steel industry from 2018 to 2022 was [-30.927 billion yuan, +13.503 billion yuan]. In 2022, a total of 26 listed companies had a positive ESG risk/opportunity value, accounting for 57.7%. From 2018 to 2022, the proportion and number of listed companies with a positive ESG risk/opportunity value first rose and then stabilized, and the proportion remained higher than 50% (see Figure 4-16).

**More listed companies have opportunities in issues such as carbon emissions, waste and pollutant discharge, resource utilization, and employee health and safety.** In 2022, among the nine major issues, those with higher opportunities than risks include carbon emissions, waste and pollutant discharge, resource utilization, gender equality, employee health and safety, and tax intensity, all of which had an opportunity proportion close to or higher than 50%. The proportions of opportunity emergence in employee training, rural vitalization, and common prosperity are relatively low, so it is necessary to enhance the disclosure of indicators such as the number of employees in key rural vitalization counties, charity, and training hours (see Figure 4-17).



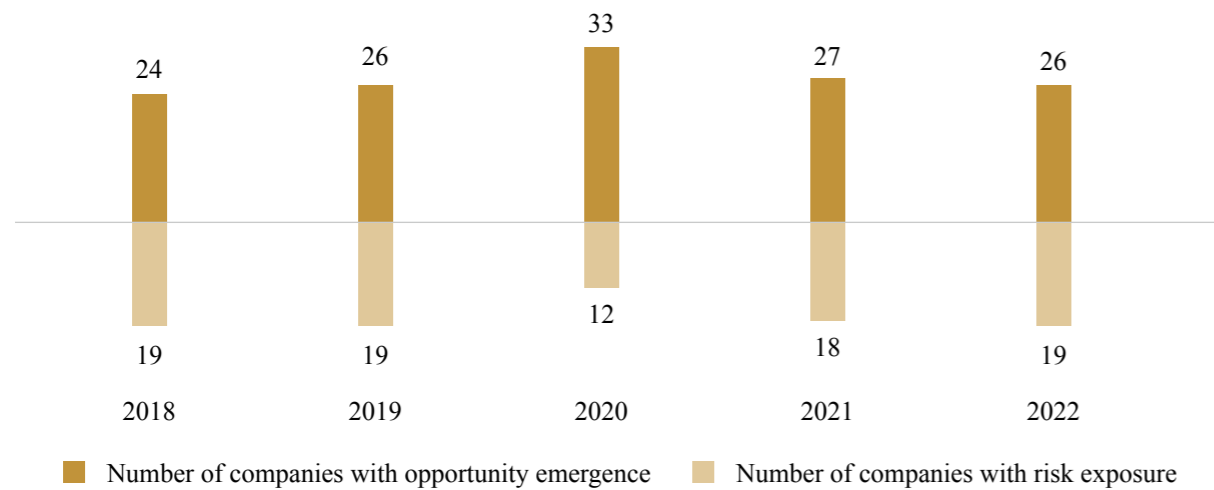


Figure 4-16 Number of listed companies with risk exposure or opportunity emergence

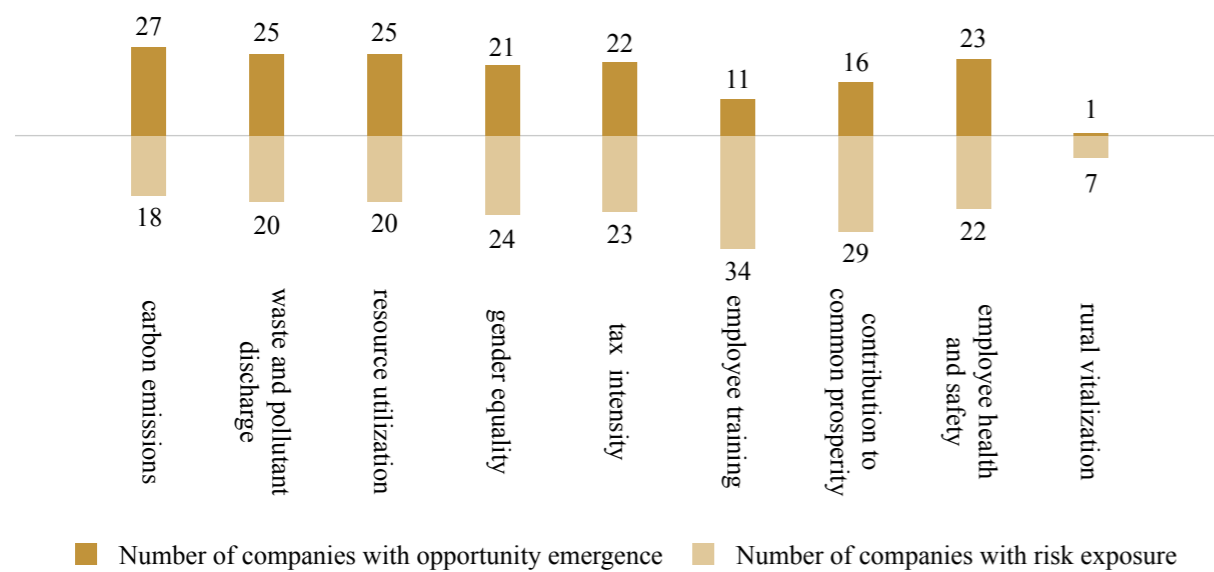


Figure 4-17 Distribution of risks and opportunities by ESG issue of listed companies in 2022

**Some listed steel companies have created net positive ESG impacts with ESG opportunity values.**

In 2022, the overall ESG risk exposure/opportunity emergence value range of the steel industry was [-30.927 billion yuan, +13.044 billion yuan]. A total of 26 companies in the steel industry register positive ESG risk/opportunity values because their ESG value creation performed better than the industry average. These companies' ESG opportunities will be translated into their financial statements through lower transition costs and increased revenues from sustainable products, improving their performance and valuation. A total of 19 companies have negative ESG risk/opportunity values, which means that these companies manifested worse ESG value creation than the industry benchmark. These risks will be reflected in their financial statements through higher costs and lower revenues and profits, pushing down their performance and valuation.

**More than half of the listed steel companies have opportunity values in carbon emissions.** In 2022, the risk exposure/opportunity emergence value range of carbon emission was [-28.510 billion yuan, +10.825 billion yuan]. A total of 27 steel companies have positive carbon emission risk/opportunity values. Although these companies emit GHGs, their carbon emission opportunities are brought by lower carbon intensity than the industry benchmark. Such opportunities will mean lower carbon costs, higher green business revenue, and other competitive advantages. A total of 18 companies in the industry have negative carbon emission risk/opportunity values. These companies emit GHGs and their carbon intensity is higher than the industry benchmark. Their risk exposure will bring competitive disadvantages such as increasing carbon costs, regulatory costs, or loss of green business revenue.

**More than half of the listed steel companies have opportunity values in waste, pollutants, and resource use.** In 2022, the risk exposure/opportunity emergence value range of waste and pollutants in the industry was [-4.314 billion yuan, +9.163 billion yuan]. A total of 25 steel companies have positive waste and pollutant risk/opportunity values. Despite the discharge of waste and pollutants, these companies do so at an intensity lower than the industry benchmark, which brings them opportunities. The positive spillover of waste and pollutant discharge will mean lower waste and pollutant treatment costs, more green business development opportunities, etc. A total of 20 steel companies have negative risk/opportunity values for waste and pollutants. These companies discharge waste and pollutants at an intensity higher than the industry benchmark, which causes risk exposures. Such negative spillovers of waste and pollutants will be translated into higher waste and pollutant treatment costs, regulatory penalties, asset stranding or devaluation, and other financial pressures.

In 2022, the risk exposure/opportunity emergence value range of resource utilization was [-246 million yuan, +720 million yuan]. A total of 25 companies in the industry have positive resource use risk/opportunity values. These companies consume natural resources at an intensity lower than the industry benchmark, which brings them opportunities. They are less dependent on natural resources than their counterparts, which means lower costs of raw materials and first-mover advantages in sustainable product development. A total of 20 steel companies have negative resource use risk/opportunity value. These companies consume natural resources at an intensity higher than the industry benchmark, thus leading to risk exposures. They are more dependent on natural resources than their counterparts, which will push up costs in raw material purchases and green transition significantly.

**Nearly half of the listed steel companies emphasize the rights and interests of female employees, with opportunity values in this regard.** In 2022, the gender equality risk exposure/opportunity emergence value range was [-19 million yuan, +35 million yuan]. A total of 21 steel companies have positive gender equality risk/opportunity values. That is because these companies hire a higher proportion of female employees than their counterparts and support female employees to engage in the development of the steel industry. They also put in place a more inclusive workplace that helps retain and expand the group of excellent employees and brings better business performance and brand value. A total of 24 companies have negative gender equality risk/opportunity values. They may face higher operating costs in the future due to a lower percentage of female employees than their counterparts.

**More than half of the listed steel companies have opportunity values in employee health and safety.** In 2022, the employee health and safety risk exposure/opportunity emergence value range was [-148 million yuan, +263 million yuan]. A total of 23 steel companies have positive employee health

and safety risk/opportunity values. The employee health and safety performance of these companies is better than the industry benchmark, which brings opportunities. Companies with opportunity emergence tend to invest more in employee health and safety and(or) have lower employee health and safety losses than their counterparts. Their high levels of occupational health and safety performance can help reduce operating costs, attract and retain top talent, and improve labor productivity. A total of 22 companies have negative employee health and safety risk/opportunity values. These companies have lower-than-average health and safety performance in the industry, making them exposed to risks. They tend to invest less in employee health and safety than their counterparts, and(or) have more occupational injuries and casualties and lost working hours. Their inadequate occupational health and safety performance may increase operating costs, cause brain drain, and lower labor productivity.

**Nearly 25% of listed steel companies attach importance to employee training, creating opportunity values in this regard.** In 2022, the employee training risk exposure/opportunity emergence value range was [-7 million yuan, +21 million yuan]. Eleven steel companies have positive risk/opportunity values for employee training. These companies provide employees with more training and(or) higher salaries than their counterparts and their employees are more competitive. A high-level workplace for employee development is conducive to attracting and retaining excellent professionals and improving labor productivity and product competitiveness. A total of 34 steel companies have negative employee training risk/opportunity values. These companies create lower growth value for employees than the industry benchmark and are thus exposed to risks.

**Nearly half of the listed steel companies have made significant tax contributions.** In 2022, the tax intensity risk exposure/opportunity emergence value range was [-932 million yuan, +1.260 billion yuan]. A total of 22 steel companies have positive tax intensity risk/opportunity values. The overall tax intensity of these companies is higher than the industry average. The tax contribution of companies with opportunity emergence is higher than the industry benchmark, with greater tax transparency and less tax avoidance. Their tax contribution can help win the favor of the government and communities and help improve social well-being. A total of 23 companies have negative tax intensity risk/opportunity values. Their lower-than-average tax contributions put them at risk, which is not conducive to the improvement of social well-being. The mismatch between their tax contributions and revenue may raise doubts and trigger stricter regulatory requirements.

**More than 25% of listed steel companies emphasize social contributions and have the opportunity value brought by common prosperity.** In 2022, the common prosperity risk exposure/opportunity emergence value range was [-31 million yuan, +129 million yuan]. A total of 16 steel companies have positive risk/opportunity values of common prosperity contributions. With satisfactory performance in charitable contributions, these companies have higher spending on education, public health, infrastructure, rural vitalization counties, and community development. These actions may help get the recognition and support of communities, explore development opportunities in less-developed areas, and expand market shares and competitiveness. A total of 29 steel companies have negative common prosperity risk/opportunity values. They invest less in education, public health, infrastructure, rural vitalization, and community development than their counterparts. This may cause doubts from communities and the public, lose market opportunities in less-developed areas, and undermine their competitiveness.

**A small number of listed steel companies disclose their employment promotion in rural**

**vitalization areas which creates value for local development.** In 2022, the rural vitalization risk exposure/opportunity emergence value range was [-2 million yuan, +119 million yuan]. Only one company has positive rural vitalization risk/opportunity values. With satisfactory rural vitalization performance, the company hires more employees or helps more locals get employed in key counties of national rural vitalization, which is conducive to obtaining recognition and support from the community and the public, exploring development opportunities in less-developed areas, and expanding market space and competitiveness. Seven steel companies have negative rural vitalization risk/opportunity values. They hire fewer employees and help fewer locals get employed in key counties of national rural vitalization than their counterparts, which may cause doubts from communities and the public, lose the opportunity to expand the market in less-developed areas, and undermine their market competitiveness.

## 5. Exploring the Application of ESG Value Accounting in Investment

ESG value accounting data refers to the quantitative accounting of corporate externalities on environment and society, which can provide a reference for investors to examine the risk and opportunity exposure of the target company in the fields of carbon peaking and carbon neutrality strategy implementation, climate change, human capital, rural vitalization and common prosperity. Investors can refer to ESG value data for portfolio construction and adjustment, and the monetized characteristics of ESG value data can also be better integrated with corporate valuation models to serve the establishment of a valuation system with Chinese characteristics.

### 5.1 Application of ESG Value in Index Investment

This section has made a preliminary exploration on applying ESG value accounting data in equity investment by incorporating ESG-related rules into the existing broad market indices in an attempt to construct the ESG index, so as to test whether the ESG index has an enhancement effect on cumulative return.

#### 5.1.1 Approach to Construct the ESG Value Enhanced Index

The ESG Value Enhanced Index is benchmarked to the CSI 300 Main Index (000300.SH), and constructed by using Net ESG Value Per Share and ESG Risk/opportunity Value Per Share as stock selection factors respectively. The net ESG value reflects the net value of corporate impact on environment and society, representing the development trends for long-term sustainable development and corporate valuation. The ESG risk/opportunity value represents the comparable performance differences in net ESG values between a company and its peers, which can be used to assess the short-to-medium term ESG competitiveness of the company.

Sampling interval: The sampling interval for ESG values is from 2017 to 2021, and the sampling interval for stock market prices is from January 2018 to July 2023. Considering the impact of ESG factors on the long-term financial performance and corporate valuation, the ESG index thus examines the impact of ESG value on current stock returns during the lag-1, and the lag period can be further extended in the future.

Rebalancing frequency: In line with the rebalancing cycle of the benchmark index, the ESG index will be rebalanced twice a year in January and June.

Creating CSI 300 ESG Value Enhanced Index involves the following steps. Step one: select the CSI 300 Main Index (000300.SH) as the benchmark index, and use the index's sample stocks as the scope for stock selection. Step two: standardize quantitative stock selection factors. The net ESG value and ESG risk/opportunity value of the selected companies are normalized separately, with the proportion of the standardized value of each stock to the total sampling values serving as the weighting factor. Step three, calculate the index points by weighting the total free-float market capitalization of the sample stocks according to the weighting factors determined in step two. Step four, use the net ESG value and ESG risk/opportunity value during the lag-1 to track the CSI 300 Index constituent companies for inclusion and removal during rebalancing.

The CSI 300 ESG Value Enhanced Index is calculated as follows:

Index for the reporting period = weighted free-float market capitalization of the sample companies for the reporting period / free-float market capitalization of the sample companies for the base period × 1000

Among them, the weighted free-float market capitalization =  $\sum$  (the free-float market capitalization in the reporting period × weighting factor). The weighting factor is within the range of 0 to 1.

### 5.1.2 Market performance of the CSI 300 ESG Value Enhanced Index

Figure 5-1 and Figure 5-3 illustrate the cumulative return of two ESG enhanced indices created based on net ESG value and ESG risk/opportunity value data, respectively. Figure 5-2 and Figure 5-4 depict the trends in Cumulative Abnormal Return (CAR) of Net ESG Value Index and ESG Risk/opportunity Value Index. During the sampling period, the CAR of Net ESG Value Index over CSI 300 Index is 122.65%, while the CAR of ESG Risk Opportunity Value Index over CSI 300 Index is 67.29%.

From the following figures, we can find that the ESG Value Enhanced Index shows the following four characteristics:

1. The overall trend of the ESG Value Enhanced Index is consistent with the main index. The cumulative return trend for the two ESG value enhancement indices shows an initial ascent followed by decline, aligning with the cumulative return trend of the CSI 300 Index.
2. The cumulative return of the ESG Value Enhanced Index compared to the CSI 300 Index has a strong upward and supportive effect. In an uptrend market, when the cumulative return of the CSI 300 index is higher, the cumulative return of the ESG index also shows an upward trend, and the cumulative return rate is accelerating. At its peak, the cumulative return of the Net ESG Value Index is almost 8 times of the cumulative return of the CSI 300 Index, and the cumulative return of the ESG Risk/opportunity Value Index is close to 7 times of the cumulative return of the CSI 300 Index. In a downside market, when the cumulative return of the CSI 300 index declines, the cumulative return of the Net ESG Value Index also shows a downward trend, immediately followed by a trend reversal.
3. The ESG Value Enhanced Index is more sensitive in the rising phase and less sensitive in the falling phase, leading to higher gains and fewer losses for investors. In a volatile upward phase, the cumulative return of the Net ESG Value Index and the CSI 300 Index has a high correlation with synchronized movements. Conversely, during a volatile downward phase, there is an approximately half-year lag for the cumulative return trend of the Net ESG Value Index in comparison to the CSI 300 Index, offering active market observers responsive intervals and time for rebalancing. ESG indices are more sensitive in the rising phase and less sensitive in the falling phase, which helps investors capture higher gains while minimizing losses.

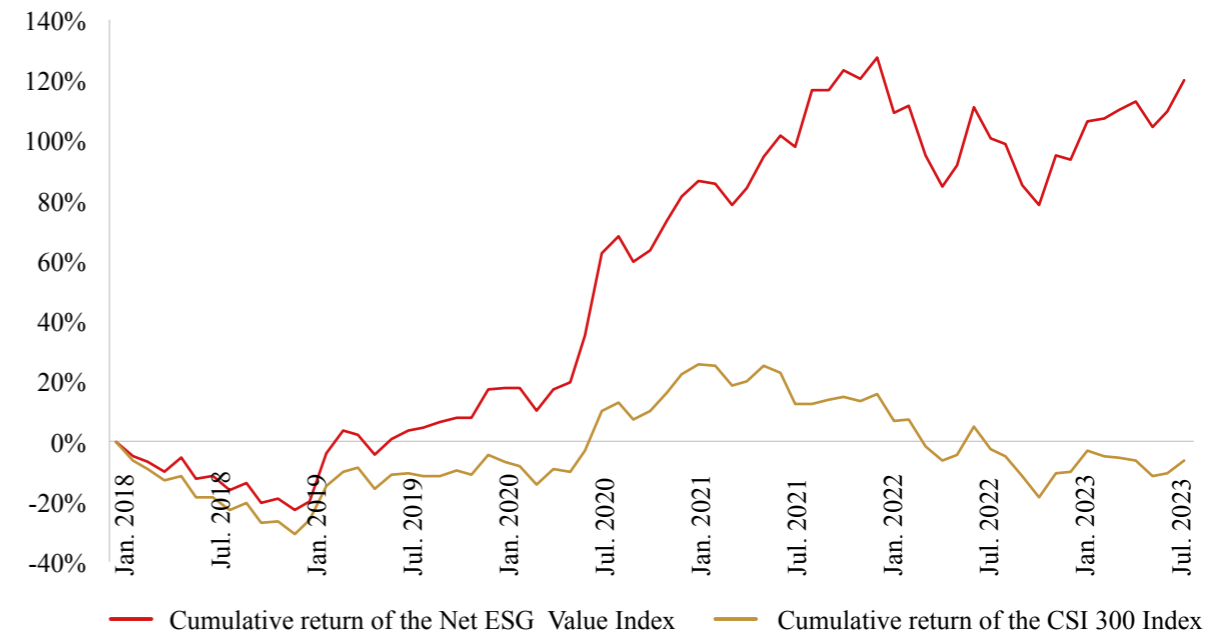


Figure 5-1 Cumulative return of the Net ESG Value Index

Data sources: Net ESG value data is from oneseg.cn, stock price and SCI 300 Index rate of return data are from Wind Financial Terminal

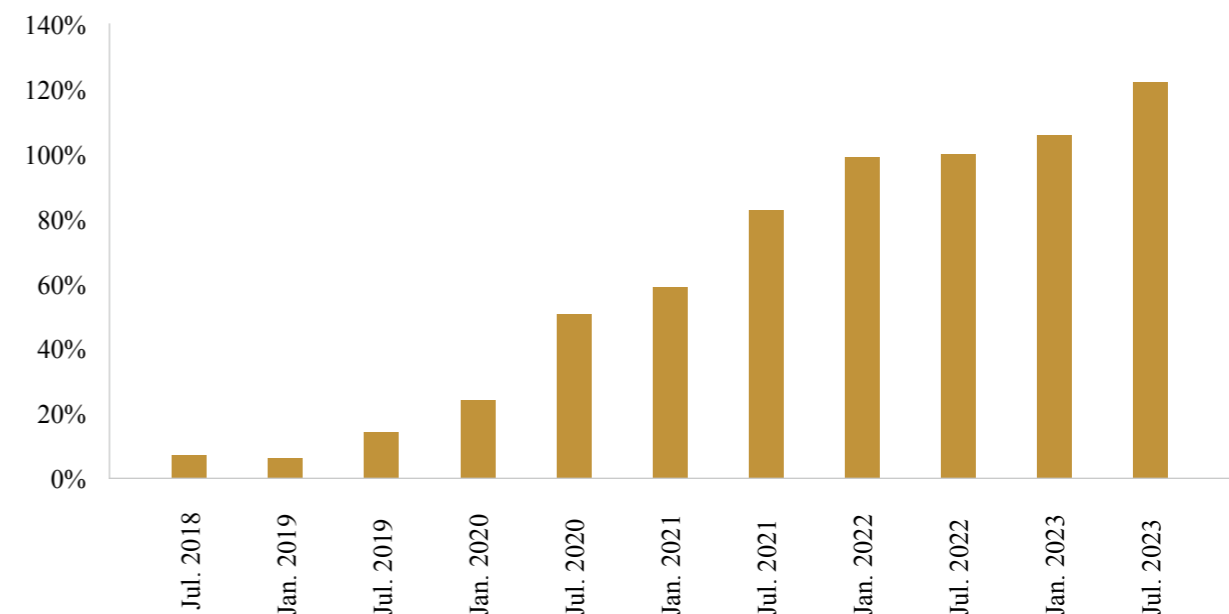


Figure 5-2 CAR of the Net ESG Value Index

Data sources: Net ESG value data is from oneseg.cn, stock price and SCI 300 Index rate of return data are from Wind Financial Terminal

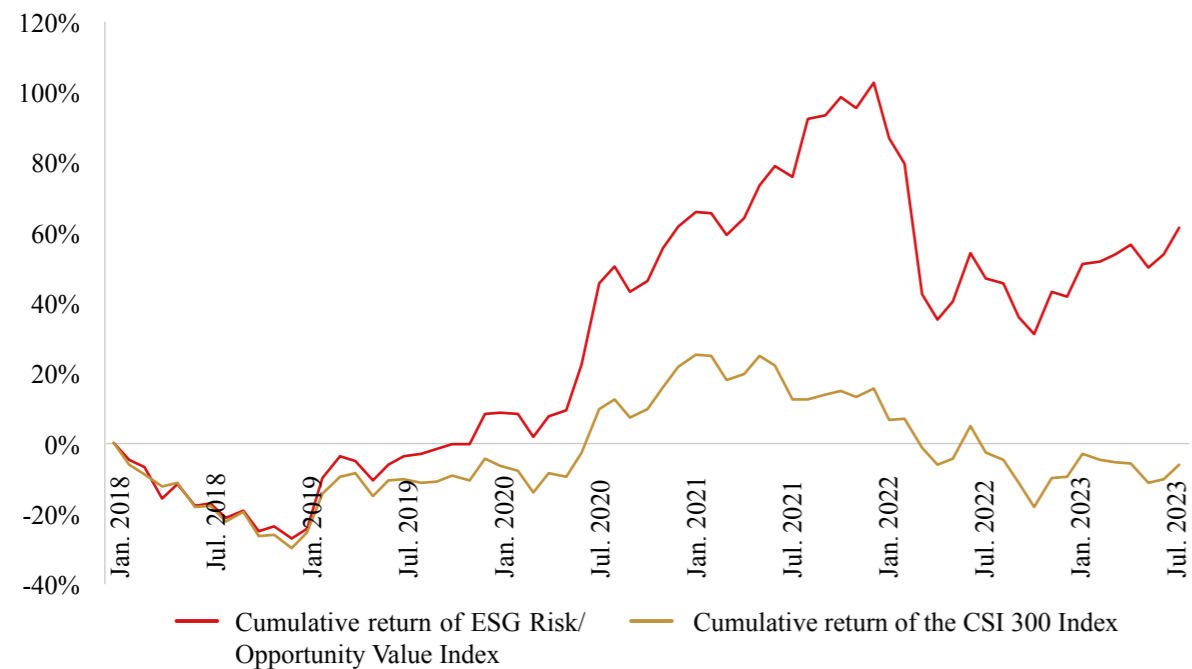


Figure 5-3 Cumulative return of ESG Risk/Opportunity Value Index

Data sources: ESG risk/opportunity value data is from oneesg.cn, stock price and SCI 300 Index rate of return data are from Wind Financial Terminal

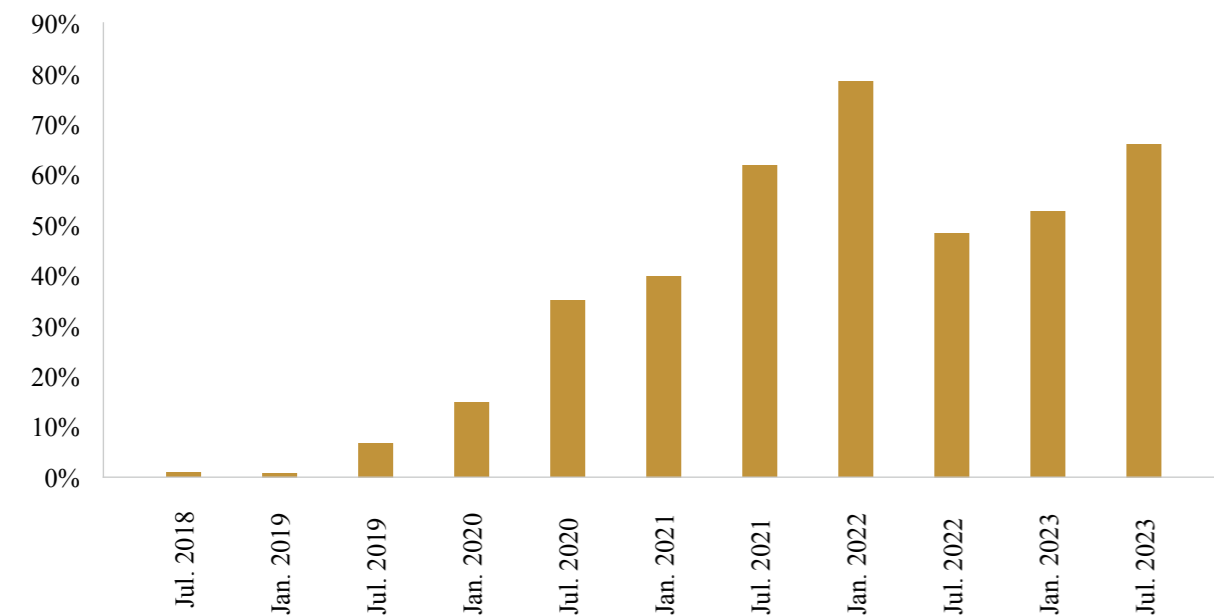


Figure 5-4 CAR on ESG Risk/Opportunity Value Index

Data sources: ESG risk/opportunity value data is from oneesg.cn, stock price and SCI 300 Index rate of return data are from Wind Financial Terminal

## 5.2 ESG Value in Corporate Valuation

The 2023 working meeting of the China Securities Regulatory Commission (CSRC) proposed to fully understand factors such as the characteristics of industrial development in China, institutional features, and the sustainability capability of listed companies. It urged all relevant stakeholders to strengthen research efforts, apply research results effectively, and progressively improve the valuation and pricing logic tailored for diverse company types and the valuation system with Chinese characteristics. The aim is to optimize the resource allocation function of the capital market. The integration of ESG (environmental, social and governance) factors into investment and financing considerations is highly consistent with the requirements of the valuation system with Chinese characteristics that contributes to Chinese modernization. The monetized ESG value data can be better combined with financial indicators and integrated into corporate valuation models to reflect the long-term development potential of different companies. This section uses the discounted cash flow model (DCF model) as an example to initially explore ESG value's application in corporate valuation.

### 5.2.1 The Application of ESG Value Meets the Requirements of the Valuation System with Chinese Characteristics

The goal of constructing the valuation system with Chinese characteristics is to contribute to the Chinese modernization, so that the market can find sustainable companies that meet the requirements of the Chinese modernization, promote the allocation of resources in a higher-quality and more sustainable manner, and better play the role of the capital market in contributing to the Chinese modernization.

The report of the 20th CPC National Congress expounded the significance of Chinese modernization from the following five main aspects. Chinese modernization is the modernization of a huge population, of common prosperity for all, of material and cultural-ethical advancement, of harmony between humanity and nature, and of peaceful development. The features of Chinese modernization define the basic principles of developing the valuation system with Chinese characteristics. It is important to conduct value accounting on a company's externalization that is conducive to the common prosperity for all, material and cultural-ethical advancement, harmony between humanity and nature, and peaceful development.

At present, the capital market is incorporating ESG factors into investment and financing practices, and ESG investing itself is the valuation of investment and financing targets, to perfectly match the requirements of the distinct valuation system serving the Chinese modernization by adding sustainable factors such as ESG to the traditional financial and economic valuation.

To incorporate environmental considerations in the valuation of ESG investing is in line with the harmony between humanity and nature required by the valuation system with Chinese characteristics. Environmental factors include a company's performance in areas such as emissions, resource utilization, environment and natural resources, and climate change mitigation and adaptation. In terms of emissions, the valuation considers the potential value created by the company through carbon emissions reduction and the implementation of pollution prevention and control measures. This is quantified by accounting the value of carbon emissions, and waste and pollutants. Regarding resource utilization, the potential value created by the company in terms of resource conservation, resource

efficiency improvement, and resource shortage alleviation is reflected by assessing the value of various resource utilization.

The consideration of social factors in the valuation of ESG investing aligns with the requirements for the valuation system with Chinese characteristics that aims at the common prosperity for all. Social factors include how a company manages its relationships with employees, suppliers, customers, and the communities it operates. This includes its performances in term of employment, health and safety, development and training, labor policies, supply chain management, product responsibility, and community investment. In the employee dimension, the accounting of values of gender equality, employee health and safety, and employee training can reflect the company's efforts and potential value creation in improving employees' compensation and benefits, ensuring health and safety, and promoting employee development. It is to enable workers to obtain a fair income in the market for a better life, underscoring the company's contribution to the primary distribution. On tax payment, the value accounting of tax intensity reflects the company's potential value creation through timely and full tax payments and enhancement of tax transparency, reflecting its contribution in redistribution. In the dimension of community engagement, the value accounting of the contribution to common prosperity and rural vitalization can reflect the potential value of the company's commitments in charities and other public welfare undertakings, actively contributing to rural vitalization, and supporting under-developed regions and groups to share the fruits of development, reflecting its contribution to the tertiary distribution.

The application of ESG accounting in the ESG investing of listed companies can translate the impact of ESG factors into visualized financial accounting results. This approach demonstrates the value creation of listed companies in the course of Chinese modernization, and allows financial institutions and investors to intuitively understand the contributions made by listed companies to the environment and society. It, in turn, will broaden the investment and financing channels required for the green and sustainable transformation of listed companies, and inform investors of whether their funds are truly invested in sustainable companies that meet the requirements of Chinese modernization.

### 5.2.2 The impact mechanism of ESG value on the valuation of listed companies

The valuation techniques for listed companies include asset-based valuation, market approach and income approach, etc. The asset-based valuation determines the value of a company by assessing its assets and liabilities, but cannot gauge its profitability and other intangible assets not reflected in the balance sheet. The market approach relies on the accurate judgment of the company's comparable value and the effectiveness of a mature capital market by analogy for valuation. The income approach assesses the value of a company by discounting future earnings. Commonly used valuation models include the discounted cash flow model, discounted dividend model and discounted economic profit model. This section attempts to use the discounted cash flow model (DCF model) to study the impact mechanism of ESG value on the valuation of listed companies.

The fundamental concept of DCF model is the time value of assets, determining a company's value through forecasting and discounting its future cash flows at a certain discount rate. The numerator denotes the future cash flows of the company, and the denominator is the weighted average cost of capital, also the expected return of investors. As for the numerator, since the ESG risk- opportunity value will be transformed into the revenue and cost of the company in the future, the incorporation of

ESG risk/opportunity value and the future cash flows into the corporate valuation can fully reflect the fundamentals of the company by taking into account the impact of sustainability-related factors on its cash flows. As for the denominator, since the net ESG-related impact will affect the expectations of various stakeholders on return of the company, the combination of net ESG value and expected rate of return (RoR) comprehensively reflects the market confidence in and the expected return. Broadening

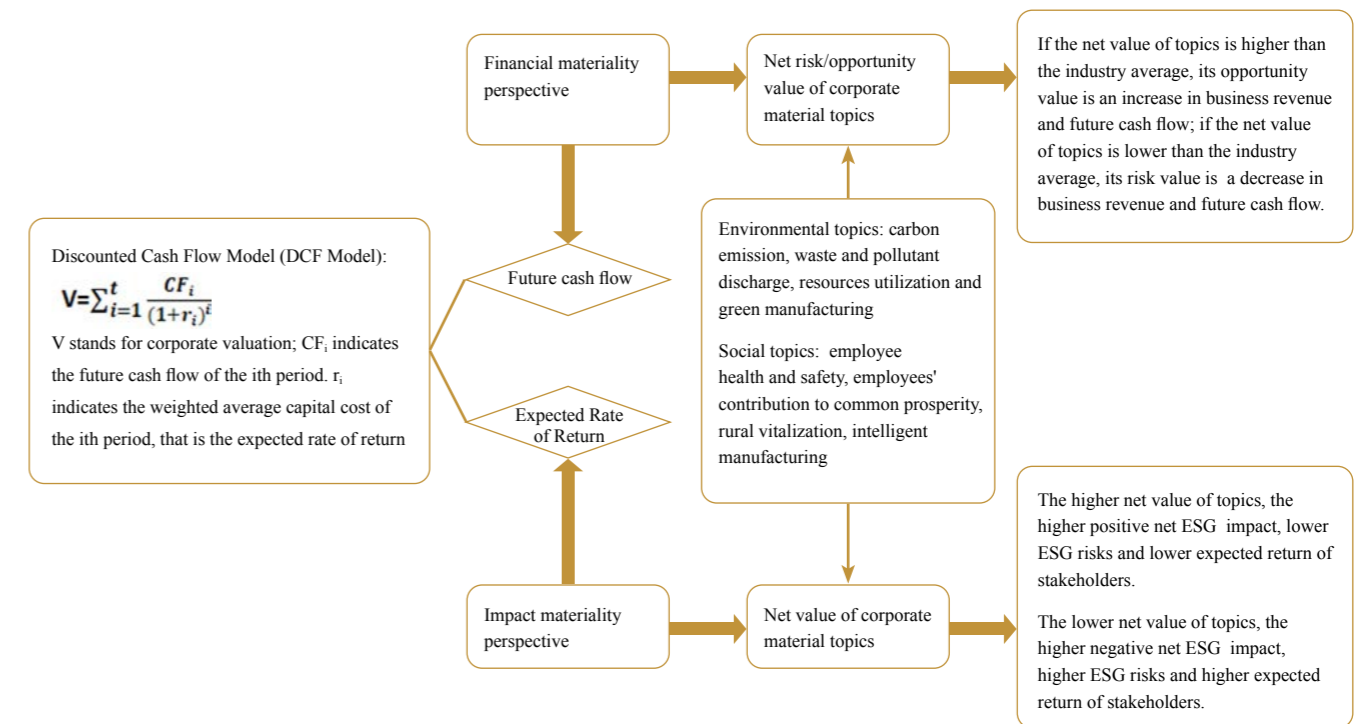


Figure 5-5 The impact mechanism of ESG value on the valuation of listed companies

the scope beyond equity owners and creditors to include all stakeholders affected by the company, including employees, suppliers, and consumers.

**The impact mechanism of ESG risk/opportunity value on the future cash flow of listed companies is mainly based on the impact of the launch of ESG-related policies.** The average development level of the industry is an important basis for policy introduction and adjustment, and the ESG risk/opportunity value is calculated based on the industry benchmark. Therefore, the expected impact of risk/opportunity value will be embodied in the government's short-to-medium term ESG policy formulation process. The anticipated impact on the company's cash flows becomes evident. A positive ESG risk/opportunity value means that the company is expected to generate higher revenue or achieve cost reduction in the future due to its ESG performance surpassing industry averages, which will positively influence the company's future cash flows. Conversely, a negative value indicates that the company may face risks such as shrinking revenue and increasing costs in the future due to its below industry-average ESG performance, which will have a negative impact on the company's future cash flows. For example, the government sets carbon quotas for listed companies. Those exceeding

their carbon quotas need to pay for carbon sinks on the carbon trading market, while companies with lower carbon emission intensity can generate non-operating income by selling carbon sinks they saved.

**The impact mechanism of net ESG value on the weighted average cost of capital of listed companies will influence a company's future cost of capital rate, mainly based on the expectations of stakeholders and its overall impact of the sustainability.** The net ESG value is assessed based on key issues of listed companies such as carbon emissions, resource utilization, and employee health and safety, reflecting the overall positive and negative impacts of companies on the environment and society. The greater the positive net impact a company has on its employees, suppliers and customers, the lower the long-term development risk and the lower RoR expected by stakeholders. However, a higher negative net impact on employees, suppliers and customers correlates with increased long-term development risk of the company and higher RoR expected by stakeholders. Taking the employee health issue as an example, more investment made by listed companies in their employees' health and safety would lead to enhanced employee productivity and efficiency, the positive net impact on employees and the downstream of the supply chain, and the higher employee loyalty and public recognition, as well as the decrease of major safety accident risks and the lower expected RoR of stakeholders. On the contrary, less investment made by listed companies in the health and safety of their employees would result in the increase of the employee productivity and efficiency, the less positive net impact on employees and the downstream of the supply chain, and the lower employee loyalty and public recognition, as well as the rising risk of major safety accidents and the higher expected RoR of stakeholders.

## 6. Outlook of the ESG Value Accounting System of Listed Companies

The ESG value accounting system of listed companies is a frontier exploration in line with the requirements of Chinese modernization and the latest development trend of ESG evaluation at home and abroad. This report puts forward the methodology of ESG value accounting system, carries out the ESG value accounting trials by taking listed companies as examples, and preliminarily explores the application scenarios of ESG value accounting system in the investment field. In the future, with the in-depth implementation of the carbon peaking and carbon neutrality strategy, the further improvement of the sustainable finance policy ecology, and the introduction and application of sustainability-related financial information disclosure rules represented by the ISSB standards, the corporate ESG data foundations will be further improved, and the methodology of the ESG value accounting system will be further matured, so as to facilitate the establishment of a world-leading ESG evaluation system with Chinese characteristics, thus contributing to the development of global sustainable investment and financing.

**Firstly, to improve policies and standards related to ESG value accounting by exploiting the pioneering role of environmental value accounting infrastructure such as carbon emission statistics and ecological service accounting.** In the context that China's carbon peaking and carbon neutrality goals and energy transition become important national strategies, the NDRC, the National Bureau of Statistics, and the Ministry of Ecology and Environment jointly issued the *Implementation Plan for Accelerating the Establishment of a Unified and Standardized Carbon Emission Statistical Accounting System*, which requires the formation of a sound, unified and standardized carbon emission statistical and accounting system by 2025, comprehensively improving data quality, and providing comprehensive, science-based and reliable data support for carbon peaking and carbon neutrality. China's carbon emission statistical and accounting system is gradually being built, laying a solid foundation for companies to carry out extensive carbon emission accounting and disclosure. In addition, standards and pilot work such as Gross Ecosystem Product (GEP) accounting are also underway. In 2020, the Research Center for Eco-Environmental Sciences of Chinese Academy of Sciences and other institutions jointly released the *Technical Specifications for Accounting Gross Ecosystem Product (GEP) for Ecosystem Assessment (Draft for Comments)*, which clarifies the accounting standards and methods for the value of ecosystem provisioning services, regulating services and cultural services. This provides experiences for establishing value accounting methods and formulating policies and standards for other ESG factors, which is conducive to the formation of policies and standards for ESG value accounting.

**Secondly, to promote the transformation of ESG value information and its organic integration with corporate financial statements with the inclusion of carbon emission rights assets and other data into financial statements as the guidance.** The ESG value accounting system quantifies costs and benefits of corporate externality, and provides references for relevant institutions to study and formulate accounting treatment regulations and accounting standards related to ESG indicators. At the same time, as relevant systems will be gradually established, it is possible for financial statements to reflect ESG value. For example, in terms of the inclusion of carbon-related financial data into financial statements, the NDRC has promulgated the *Interim Measures for the Administration of Voluntary Greenhouse Gas Emission Reduction Trading*, which implements record filing management for domestic GHG voluntary emission reduction projects, project emission reductions, emission reduction trading, validation and certification, initiates China Certified Emission Reduction (CCER) and introduces domestic voluntary emission reduction trading markets. In 2019, China officially issued

the *Interim Provisions on Accounting Treatment of Carbon Emission Right Trading*, which confirm that CCER, as part of the non-statutory carbon emission right quota, should be accounted for under the item of "China Certified Emission Reduction – CCER". In addition, the provisions also clarify the setting of accounting items, accounting methods, accounting treatment principles and the presentation and disclosure of financial statements, so as to guide companies to reflect the costs and benefits of carbon emission reduction in their financial statements. With the continuous improvement of the value accounting standards for environmental issues such as carbon emissions and ecological values, the quantitative data and methodologies of environmental indicators will be further improved and matured, and relevant institutions can gradually promote the accounting recognition and measurement of ESG-related quantitative indicators and ESG value accounting data from the perspective of environmental value accounting such as carbon emission reduction and ecological value, so as to provide reference and operational guidelines for companies to prepare ESG value accounting statements.

**Thirdly, to carry out sustainable investment by reference to ESG value accounting data by leveraging global sustainable finance development trends.** With the rapid development of ESG investing, ESG factors play an increasingly important role in the capital market. Investors attach great importance to analyzing the stock market performance of companies with reference to ESG factors, actively adopt ESG investing strategies, and select stocks and assets with long-term investment value. Through quantitative calculations, ESG value accounting reflects the role of resource allocation in valuation through quantitative calculations, embodies the environmental and social impact caused by companies for various stakeholders, and calculates externalized net value to provide a straightforward reference<sup>1</sup> for investors to understand whether funds are really invested in sustainable companies. ESG value accounting data can help investors explore the externality value of companies to the environment and society, and screen investment target companies that still have investment potential in sustainable transformation, so as to ensure the long-term capital supply for transformation and achieve the goal of sustainable development driven by capital. Investors can refer to ESG value accounting data to analyze the impact of ESG factors on the future financial performance and valuation of companies, construct portfolios by screening companies that are in line with sustainable development trends, and adjust portfolios through monitoring changes in corporate ESG risk/opportunity exposure, so as to match financial supply with financing needs of the real economy, and guide the flow of resources to the real economy.

**Fourthly, to prepare ESG statements with ESG value accounting data by delivering sustainability-related financial information disclosure policies.** With the improvement of ESG disclosure policies and the development of ESG value accounting system, companies may be able to prepare ESG statements based on ESG disclosure standards and ESG value accounting methodology just like the preparation of financial statements. ESG statements can visualize quantitative data on the environmental and social dimensions of a company. In terms of operations, companies can use these data to measure the costs and benefits of corporate ESG management, then evaluate those issues that need to be further invested in resources for improvement, and develop an effective ESG cost accounting system through monetized data, so as to provide strategic reference for the directions of corporate resources and capital flow. In term of investment, ESG value accounting promotes companies to consider their impact on society and environment in their business operations and production activities, and encourages listed companies to continuously improve their governance, risk response

<sup>1</sup> Yin Gefei, Qualifying ESG value for valuation system with Chinese characteristics, 2023.



capabilities, and capabilities to deliver long-term returns, so as to attract capital investment from the capital market, thus promoting the increase in the proportion of direct investment and financing. In this way, a virtuous circle of investment from the asset side to the listed companies has been taking shape, providing guidance to the high-quality development of listed companies.



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