

# Integration of occupational health and safety management, social responsibility of business, and sustainability: A stakeholder-based qualitative study on China's electric power industry

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**Abstract:** Improving working conditions and promoting the health, safety and well-being of workers are highly relevant to the social responsibility of business and the sustainability of enterprises. This empirical study investigates the successes and barriers of the integration of occupational health and safety management (OHSM), corporate social responsibility (CSR), and sustainability in China's electric power industry, with the combined theoretical framework of New St. Gallen Management Model and stakeholder theory. Semi-structured interviews were carried out among the internal, external and distal stakeholders (n=90), supplemented with on-the-spot observations. Through statistical and discourse analysis, it is found that the integration of OHSM, CSR, and sustainability has been achieved at the structural, operational, and organizational levels in China's electric power industry, due to the fast development of technology and the legal system ensuring a good environmental sphere, with people-centered philosophy being highlighted. However, some deficiencies such as law reinforcement and the coherence between internal and external stakeholder management systems must be improved, particularly with respect to frontline workforce training. The communication of OHSM, CSR, and sustainability outside of the industry should also be enhanced for a better environmental sphere and public support.

## 1. Background

The electric power industry is an essential basic industry of China's national economy, playing a key role in ensuring social and economic development. China's rapid economic development is supported by the sustainable development of electric power enterprises. After China's accession to the World Trade Organization, the "three-system certification" is a significant symbol of enterprise management modernization and a standard that power enterprises must meet. The three-system certification refers to the ISO9001, ISO14001, and ISO45001 (or GB/T 45001-2020) certifications. Developed by the International Organization for Standardization (ISO), ISO9001, ISO14001, and ISO 45001 are quality, environmental, and occupational health and safety (OHS) management system standards, respectively. GB/T 45001-2020 (*Occupational Health and Safety Management System Requirements and Guidelines*) is a new Chinese national standard that was officially released and implemented on March 6, 2020; it is equivalent to ISO 45001:2018 and was introduced as a replacement for GB/T 28001-2011 and GB/T 28002-2011 (*Occupational Health and Safety Management System Requirements*). GB/T 45001-2020 adopts the high-order structure of the ISO/IEC guidelines and risk-based thinking, and it emphasizes the organizational environment and the needs

and expectations of staff members and other stakeholders. It also enhances the role of leadership, staff consultation, and participation. Operational control requirements are enhanced with the addition of procurement, contractor, and outsourcing control requirements. The requirements for hazard identification and risk assessment are enhanced. Under the new standard, an organization focuses not just on immediate health and safety concerns but also considers societal expectations. Organizations are required to consider their subcontractors and suppliers; for example, they must consider how their own work affects their neighbors in the surrounding area. This scope is broader than one that only focuses on internal staff conditions; hence an organization cannot "outsource" its risks. GB/T 45001-2020 emphasizes the integration of OHS factors throughout an organization's management system, and it requires a higher level of recognition from management and leadership. This represents a major change for companies that are currently accustomed to delegating the responsibility of safety to a safety manager rather than fully integrating it into their operations. OHS factors are no longer an add-on but an integral component of an organization's complete management system.

The three-system certification model can be regarded as a modern management system for the integration of OHS, corporate social responsibility (CSR), and sustainable development (SD). First, the certification and

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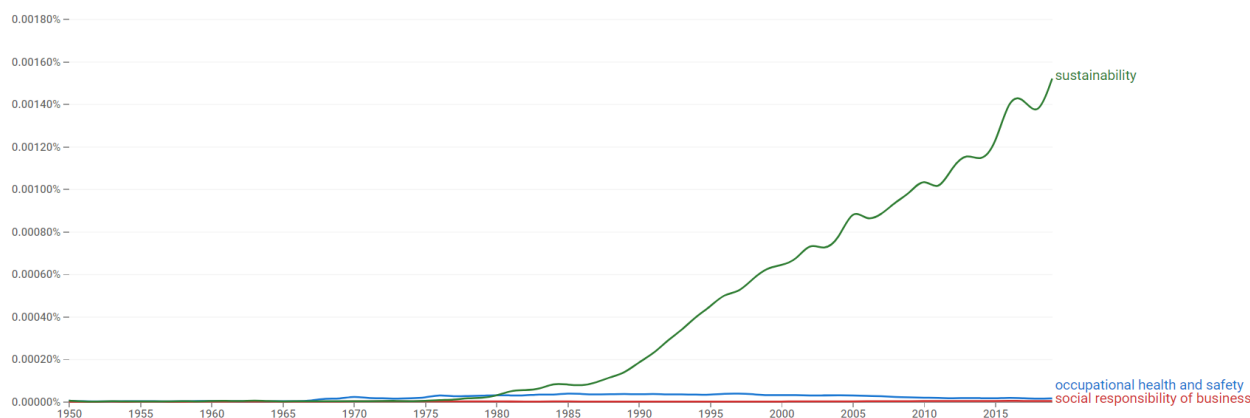
implementation of the three systems play an essential role in legalizing enterprise management. Second, it allows employees to be mobilized to participate in enterprise management. The management of concepts, ideas, and goals contained in system document content can be conveyed to employees, thereby allowing them to take conscious action. Third, the enterprise is required to establish an effective mechanism for implementing active self-improvement and continuous improvement. In China's electricity industry, the service quality of power enterprises is continually improving; they achieved energy saving and emission reduction objectives and effectively reduced occupational health and work-related accidents and occupational disease hazards.

In addition, China's legal system is undergoing continual improvements. A series of laws and regulations, such as the Work Safety Law, Occupational Disease Prevention and Control Law, and Law on the Protection of Women's Rights and Interests, provide a good social environment for the integration of OHS management, CSR, and sustainable development.

## 2. Literature review

### 2.1. General research trends

The Google Books Ngram Viewer and EBSCO databases were searched (on August 1, 2021) using the terms



**Figure 1.** Research trends for occupational health and safety, social responsibility of business, and sustainability according to Google Books Ngram Viewer.

**Table 1.** Frequency and overlapping of studies (in EBSCO database) relating to occupational health and safety, social responsibility of business, sustainability, and stakeholders.

Entry (history) (frequency)	Dictionary Vocabulary (frequency)
Occupational health and safety (1959-2021) (3939)	Work environment (155)
	Environmental management (29)
	Social responsibility of business (23)
	Environmental health (18)
	Corporate culture (16)
	Strategic planning (12)
Social responsibility of business (1926-2021) (49050)	Business ethics (5875)
	Sustainable development (2042)
	Corporate culture (1793)
	Stakeholders (1739)
	Strategic planning (1009)
	Environmental responsibility (994)

Entry (history) (frequency)	Dictionary Vocabulary (frequency)
	Business enterprises & the environment (850)
	Environmental protection (795)
	Business & the environment (627)
	Environmental policy (408)
	Work environment (385)
	Environmental management (370)
Sustainability (1902-2021) (414554)	Sustainable development (62138)
	Sustainability (20533)
	Social responsibility of business (6336)
	Environmental protection (5143)
	Climate change (4902)
	Environmental impact analysis (4556)
	Environmental policy (3621)
	Strategic planning (3131)
	Stakeholders (2626)
	Environmental management (2301)
	Economic development & the environment (1996)
	Medical care (1775)
	Ecology (1271)
	Forest management (960)
Environmental law (717)	
Stakeholders(1922-2022)(278,429)	Social responsibility of business (5262)
	Medical care (3641)
	Sustainable development (3542)
	Stake holder theory (2785)
	Strategic planning (2598)
	Public health (2168)
	Technological innovations (1555)
	Medical policy (1380)
	Sustainability (1264)
	Climate change (1228)
	Environmental impact analysis (1065)
	Environmental policy (980)
	Health services accessibility (973)
	Environmental protection (951)
	Environmental management (925)
	Health promotion (831)
	Mental health services (712)
	Work environment (707)
Systematic reviews (medical research) (659)	
Clinical trials (594)	

## 2.2. Relevant empirical studies

Researchers are increasingly exploring the integration of OHSM, SRB, and sustainability. Rüeegg-Stürm perceived firms as complex systems and focused on the basic categories of the integrated management model, which include the environmental sphere, stakeholders, structuring forces, process management, organizational changes, and their interactions.<sup>[9]</sup> For structuring forces, further analyses can be conducted with respect to the strategy, structures, and culture of a firm. Chinese scholars such as Mei and Liu have conducted a series of empirical research on safety management and explored the interactions between company profits, employees' work performance, and OHS management. In their study, a 33-

item questionnaire was administered and 867 valid responses were collected to examine the relationships between perception of expected accident loss, safety attitude, and enterprises' work safety behavior. Their results indicate that the perception of expected accident loss and safety attitude have significant direct positive effects on enterprises' work safety behavior. <sup>[10][11]</sup> Nkrumah et al. investigated the moderating and mediating effects of work motivation on the causal link between OHSM practices and work performance in the oil and gas sector.<sup>[12]</sup> A group of German scholars have also conducted studies on the interactions between CSR and OHS management in Germany. A study by De Oliveira Matias et al. explored the integration of the standards systems of quality management, environmental management, and

OHS management, and it prospectively analyzed the advantages and disadvantages of integrating these systems relative to the independent management of these systems in a manufacturing company.<sup>[13]</sup> Kuhn et al. explored the emerging intersection of OHM and CSR by summarizing the existing research literature and available standards and instruments with the aim of establishing a conceptual basis for a joint reflection of OHM and CSR in the future. Through individual semi-structured qualitative interviews, researchers discovered several areas in which OHM and CSR were already interacting in German companies at the strategic, structural, and cultural levels; however, they also highlighted the presence of barriers that undermine more meaningful interactions, such as difficulties in articulating the underlying ethical values that are relevant to both OHM and CSR at the strategic level, a lack of both financial and knowledge resources at the structural level, lack of fully developed OHM and CSR departments or the implementation of OHM and CSR at varying operational levels, lack of practical corporate philosophy integration at the cultural level, and lack of adherence (among employees and managers) to existing guidelines and company philosophies that already connect OHM and CSR.<sup>[14]</sup>

The aforementioned studies have served as meaningful references for the present study in both the theoretical and methodological dimensions.

### 2.3. Stakeholder theory

The stakeholder theory is a theory of business ethics and organizational management that is centered on the social values of the business. Systems theory researcher Ackoff introduced the concept of stakeholders in organizational systems. Through the placement of stakeholders in an organizational system to redesign its organizational structure, a network of stakeholder interactions and openness can be established to help solve social problems.<sup>[1]</sup> Freeman elaborated on the stakeholder theory in his book, in which he posited that a company is a series of contracts, negotiations and transactions between various stakeholders, such as investors, managers, employees, customers, suppliers, government departments, and communities, all of which make dedicated investments in the company and share the resulting risks. Therefore, to ensure sustainable development, an enterprise should be accountable to stakeholders and shareholders, with the interests of internal and external stakeholders being considered in the corporate governance process.<sup>[2]</sup> Sirgy proposed the subdivision of stakeholders into three categories, namely internal, external, and distal stakeholders. Internal stakeholders include the employees, managers, corporate departments, and board of directors of a firm. External stakeholders include a company's shareholders, suppliers, creditors, local communities, and the natural environment. Distal stakeholders include competitors, consumers, publicity media, government agencies, voters, and labor unions.<sup>[3]</sup> The core concept of the stakeholder theory is that organizations should balance the interests of multiple stakeholders in an integrated manner rather than focusing only on the accumulation of

shareholder wealth. Companies should not focus only on financial performance, but also social benefits. Business managers should understand and respect all individuals who play a key role in an organization's behavior and results and attempt to meet the needs of these individuals. According to the stakeholder theory, the inclusion of multiple stakeholders in organizational decision making is both an ethical requirement and a strategic resource, and it contributes to an organization's competitive advantage.<sup>[4][5]</sup> All of the aforementioned concepts differ in focus but share the same theoretical core, that is, they consider the role of an organization in a larger and more open system and, thus, establish new requirements for corporate behavior.

### 3. Research design

Semi-structured interview guides relating to the interactions between OHSM, SRB, and sustainability were developed by the authors (see Additional File) based on the latest Chinese national standard GB/T 45001-2020 (Occupational Health and Safety Management System Requirements and Guidelines) and the stakeholder theory. Pretests were conducted by scholars who specialize in the safe management and experts who specialize in safety inspection and assessment in the electricity industry. Interviews were mainly conducted through the WeChat application between March 2021 and July 2021 (interviews were recorded with participants' consent) with a sample of 90 stakeholders in China's electricity industry in China (Table 2); they consisted of internal stakeholders from power plants (n=7), electricity supply companies (n=2), and an electricity science research institute (n=1); external stakeholders from suppliers (n=3) and outsourcing companies (n=2); and distal stakeholders who are members of the public and also electricity customers (n=30). The participants from the electricity science research institute comprised professional personnel who specialized in safety and environment assessment, hydropower safety evaluation, electric power testing and research, environmental protection research, coal quality supervision and inspection, and integrated management, all of which are related to the technology support and quality and safety inspection and assessment of power plants. The interview audio recordings and transcripts were analyzed through statistical, discourse, and comparative analyses. Furthermore, on-the-spot observations of three power plants and one outsourcing company were performed to supplement the research.

**Table 2.** Overview of interviewed stakeholders.

Category	Sample	Interview
Internal stakeholder	Official leaders and employees of electric power generation and electric power supply companies	19 (6 companies)
	Official leaders and experts from an electricity scientific research institute	11 (1 institution)
External stakeholder	Business partners (i.e., suppliers and outsourcing companies)	30 (4 companies)
Distal stakeholder	Members of the public (i.e., customers)	30 (5 provinces)
Total		90

The main structure of the interview includes the self-

introduction and implementation of OHSM, SRB, and sustainability; interactions between OHSM and SRB; and interactions between OHSM and sustainability. The list of items discussed included top leaders' engagement, organizational arrangements, budgeting, specific measures, frequently discussed topics, employee participation, regular assessment, corporate culture,

communications, effects, and strengths and shortcomings.

Line-by-line coding was performed for all of the interviews per the deductive-inductive method used by Kuhn,<sup>[14]</sup> and the identified themes were categorized into four categories per the New St. Gallen Management Model to aid the organized presentation of the present study's findings (Table 3).

**Table 3.** Coding frame with examples of typical ideas.

		Occupational health and safety management (OHSM)	Social responsibility of business (SRB)	Sustainable development (SD)	Interactions between OHSM and SRB	Interactions between OHSM and SD	Shortcomings
Environmental sphere		Safety law and regulation system, people-centered social values, national 14 <sup>th</sup> Five-Year Plan for the technological innovation capability of enterprises	Environmental protection	High quality development	Three-system certification and three responsibilities of the industry (i.e., economic, political, and social dimensions)	Three-system certification and interactions in line with business philosophy of the industry	Inadequate law enforcement and need for more public understanding and support
Structuring forces	Strategic	14 <sup>th</sup> five-year-plan as an example	Safe energy, emission peak, and carbon neutrality	Renewable energy	14 <sup>th</sup> five-year-plan as an example	14 <sup>th</sup> five-year-plan as an example	Some employees prefer higher income to company's investment on SRB and SD
	Structural	Top leaders' engagement and employee participation	Scientific research institute with well-defined divisions	Scientific research institute with well-defined divisions	Top leaders' engagement and employee participation	Top leaders' engagement and employee participation	Inadequate performance of contractors, subcontractors, and outsourcing companies
	Cultural	Safety first as part of the corporate culture	People-centered view	People-centered view	People-centered view	People-centered view	Difficult and dangerous work requires a more professional workforce
Process (operational)		Medical care, safe training, improvement of working place environment (e.g., dust removal, radiation protection, and noise protection)	Energy-saving and emission reduction technology innovations, local community support programs, and charity activities	Low price, technological transformation, and building of more wind power and photovoltaic power stations	Management system and daily supervision	Three simultaneously implemented policies, namely the deployment, implementation, and assessment of OHS with respect to safe production	Unknown risks; frontline workers who were mainly hired through outsourcing companies lacked safety awareness, professional knowledge, and skills; local communities (such as the nearby villages) may demand extra compensation that increases the burden managed by a company
Organizational change		Management system is undergoing improvements through specific structuring forces	Management system is undergoing improvements through specific structuring forces	Management system is undergoing improvements through specific structuring forces	Management system is undergoing improvements through direction, coherence and shared purposes	Management system is undergoing improvements through direction, coherence and shared purposes	A substantial gray area exists with respect to the coherence between state-owned enterprises and their private outsourcing partners

#### 4. Results and discussions

The participants' opinions concerning the implementation of OHSM accounted for the largest proportion of the collected data (and contained a diverse variety of content) followed by their opinions on SRB and sustainable development. Among the three items, the participants were most familiar with OHS and mostly concerned about the safety and health-related problems. Among the three types of stakeholders, internal and distal stakeholders (i.e., the power plants and scientific research institute) were more confident about the integration of OHSM, SRB and sustainability, whereas the external stakeholders (i.e.,

suppliers and outsourcing contractors) focused more on the interactions between OHSM and SRB in the electric power industry.

We analyzed the participants' interview transcripts through an online corpus tool (<http://www.aihanyu.org/encorpus/CpsTongji.aspx>) and retrieved high frequency words (Table 4; all the words presented were used more than 10 times during the interviews).

**Table 4.** High frequency words used by interview participants.

	English Version (prefer to noun translation here)	Number	Frequency (%)
1	Safety	86	0.80001



2	Corporate	60	0.5582
3	Management	54	0.5024
4	Health	52	0.4838
5	Society	40	0.3721
6	Occupational	38	0.3535
7	Development	28	0.2605
8	transformation	28	0.2605
9	workforce	26	0.2419
10	production	22	0.2047
11	Law	21	0.1953
12	Carbon	20	0.1861
13	Work task	20	0.1861
14	Environmental protection	20	0.1861
15	risk	18	0.1675
16	measures	16	0.3163
17	protection	16	0.3163
18	ability	16	0.3163
19	Energy resources	16	0.3163
20	Occupational disease	16	0.3163
21	service	14	0.1302
22	company	14	0.1302
23	environment	14	0.1302
24	construction	14	0.1302
25	personnel	14	0.1302
26	awareness	14	0.1302
27	prevention	12	0.1164
28	inspection	12	0.1164
29	operation	12	0.1164
30	Abide by	12	0.1164
31	coal	12	0.1164
32	equipment	12	0.1164
33	condition	12	0.1164
34	governments	12	0.1164

Other than the words related to the research theme, technology transformation, workforce, safe production, law, low carbon, environmental protection, and risk were the words most frequently used by the participants (see word cloud in Figure 2).



**Figure 2.** High frequency word cloud of participants' interview content.

Two quantitative questions concerning the overlap among OHSM, SRB, and sustainability were asked during the interview. Table 5 presents the distribution of the participants' opinions, and it indicates a significant overlap (>75%) among OHSM, SRB, and sustainability; however, the implementation of integrated OHS–SRB management was more frequently identified (68% of participants) relative to integrated OHS–sustainability

management (by 48% of the participants).

**Table 5.** Q&A concerning overlap among OHS, SRB, and sustainability.

Type 1	From 0% to 100%, how much do you think the company is responsible for employees' health? (A 75.96% average was obtained.)
	From 0% to 100%, how essential do you think the occupational health and safety of employees are to the sustainable development of the enterprise? (An 83.96% average was obtained.)
Type 2	Corporate social responsibility and employee's health and safety are discussed and promoted simultaneously. (Of the participants, 68% agreed to this statement.)
	Sustainable development and employees' health and safety are discussed and promoted simultaneously. (Of the participants, 48% agreed to this statement.)
	Those who explicitly think they are two different things. (Of the participants, 7% agreed to this statement.)
	The opinions of the remaining participants are unclear.

The successes and barriers relating to the integration of OHSM, SRB, and sustainability in China's electric power industry were categorized to allow for an organized and clear presentation of our findings.

#### 4.1. Successes

##### 4.1.1 Environmental sphere for integration of OHSM, SRB and sustainability

The results revealed that sound management systems are being established at all levels of life in China. At present, the supervision of safe production and management system involves a combination of comprehensive supervision and industry supervision, national supervision with local supervision, and government supervision with other supervision patterns.

State-owned enterprises in China must undertake three major responsibilities, that is, economic, political and social responsibilities, with the ultimate goal of maximizing the combined effect of employee value, corporate interests, and social benefits. Development must not be at the expense of human life, which is a red line that cannot be crossed.”

The legal system was frequently mentioned because the strengthening of the rule of law is currently dominating the social climate in China, and safe production is a long-term basic state policy. The Law of the People's Republic of China on Production Safety, Occupational Disease Prevention, Control Law of the People's Republic of China, and other relative laws and regulations guarantee the safety and health of workers and preservation of national property, thereby promoting the development of social productive forces and basic conditions for ensuring the development of the national economy and further economic reforms. The National Three-Year Action Plan for Special Rectification of Work Safety(2020–2022) is a national plan for the special rectification of work safety problems by the State Council Safety Commission, and it focuses on nine industry sectors (i.e., coal mines; non-coal mines; hazardous chemicals; firefighting; road transportation; civil aviation, railroads, and other modes of transportation; industrial parks; urban construction; and

hazardous waste), which are highly exposed to hidden dangers and accident prone. Article 5 of the Company Law of the People's Republic of China stipulates that companies engaged in business activities must comply with laws and regulations, abide by social moral and business ethics standards, act in an honest and trustworthy manner, accept the supervision of the government and the public, and assume social responsibility in relation to areas such as integrity, taxation, human rights, environmental protection, anti-corruption, cultural construction, charity, poverty alleviation, and protection of employees' health.

The 10<sup>th</sup> Financial Summit was held in Shanghai and themed around the concept of growth; during the event, the USANA Program was awarded the 2021 Corporate Social Responsibility Award for its positive contribution to public welfare that was achieved through years of practical commitment (<http://news.hexun.com/2021-08-04/204090368.html>).

#### *4.1.2 Structuring forces involved in integration of OHSM, SRB and sustainability*

At the strategic level, the electricity industry is a component of the national economy and the country's five-year-plan strategy; therefore, the 14<sup>th</sup> Five-Year Plan and “双碳 (Double Carbon)” concept were repeatedly mentioned by the participants. The 14<sup>th</sup> Five-Year Plan is a strategic development plan for companies for the period from 2021 to 2025; the plan also incorporates elements of China's 2035 vision goals. High quality development is the primary goal for all industries in China, and Double Carbon refers to China's plan to achieve peak CO<sub>2</sub> emission and carbon neutrality by 2030 and 2060, respectively.

The results revealed that in state-owned enterprises, specific structuring forces influence routine tasks. For example, OHSM is usually a core responsibility of the human resource department, whereas SRB and SD are managed by the manager's office and planning department, respectively. In the investigated electricity science institute, this division is clear; the institute has a special safe and environmental protection section that is responsible for the education, inspection, and assessment of safe production for all affiliated electric companies. Top leaders share OHSM, SRB, and sustainable development responsibilities, and they ensure the direction, coherence, and shared sense of purpose among multiple divisions.

A participant indicated that the leadership emphasizes health and safety topics, the implementation of a corresponding management system, and a high degree of employee participation. The motivation to achieve technical transformation is high, and protective measures have been substantially improved. A team is responsible for enhancing daily supervision and investigating and resolving problems and hidden risks.

At the cultural level, the online interviews and offline observations revealed that technology transformation, people-centered, safe production are the three key words that were frequently used in relation to corporate culture; therefore, the integration of OHSM, SRB, and sustainability can be regarded as an ideal model of

corporate culture for electric power companies. For example, the “安全生产 (safe production)” sign is frequently displayed in electric power companies; they can often be spotted at company entrances, cafeterias, and website propaganda bulletins. The slogan “高高兴兴上班, 安安全全回家 (Go to work happily and return home safely)” is a popular one throughout China. These observations indicate that safe production has become an element of micropolitics in company management systems in the electric power industry, which requires the successful integration of OHS, SRB, and sustainability management.

In addition, the establishment of an enterprise safety culture should involve the creation of a “single people-oriented center” and “two basic points” (i.e., the penetration of safety concept and safety behavior). Organizations should constantly enhance their employees' safety awareness and sense of safety responsibility and train them to develop safety-first behavior.

#### *4.1.3 Management process for integration of OHSM, SRB and sustainability*

According to safe production laws and regulations, a systematic and dedicated supervision and management system for safe production in China should be established by combining comprehensive supervision with industry supervision, national supervision with local supervision, and government supervision with other supervision patterns. The “Three Synchronization Principles” and “Three Simultaneous Principles” are well known among the participants. The Three Synchronization Principles refer to the synchronous planning, development, and implementation of safe production, economic development, deepening reform, and technological transformation; the Three Simultaneous Principles refers to the simultaneous design, construction, and implementation of occupational safety, health technology, and environmental protection measures and facilities for construction projects. With respect to operational measures, examples of the participants' opinions are as follows:

“We set up sorting bins to collect and handle recyclable and nonrecyclable waste separately, install recycling bins, and collect hazardous solid waste such as waste batteries, ink cartridges, and toner cartridges, which are transferred to the company's Science and Information Department for consolidation and then to qualified units for proper treatment.”

“Training was conducted both online and offline. We also created a WeChat “Safety Supervision Network” work group for training purposes. The Occupational Disease Prevention and Control Publicity Manual and the 2021 Occupational Disease Prevention and Control Law Publicity Week were distributed to more than 200 workers and outsourced personnel. Driver safety training and warning education was conducted through the Internet, and it focused on the theme of Common Occupational Diseases and Prevention for Drivers, and 14 participants underwent this program. After the company's employees were educated on the prevention and control of

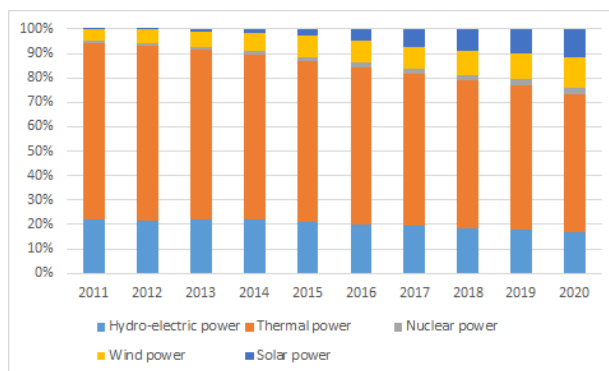
occupational diseases, their awareness of the prevention and control of occupational diseases improved substantially.”

“Technological transformations are continually implemented with the support of the scientific research institute. Such transformations include generator turbine through-flow energy-saving renovation, parameter boosting transformation, comprehensive energy-saving transformation, heat supply transformation, boiler coal blending transformation, flexibility and deep peaking transformation, desulfurization wastewater zero discharge and chemical water system transformation, boiler air and smoke system optimization transformation, W-flame-boiler ultra-low emission transformation, and DCS system wisdom transformation. Our excellent performance contributed to the safe, economic, environmental-protective, and flexible operation of the Group's electric power generating units.”

#### 4.1.4 Organizational change for integration of OHSM, SRB and sustainability

In December 2002, the State Council of China issued the Electricity System Reform Program (i.e., the No. 5 Document), which introduced the market competition into the electricity industry and proposed the “separation of power plant and electricity network, separation of main unit and auxiliary unit, separation of electricity generation and electricity supply, and competitive access to the market” as the reform path for the electricity industry. The overall goal of the aforementioned program was to break the monopoly in the electricity industry with the introduction of market competition. With the launch of the program, a series of reforms were undertaken to promote the development of the electricity industry by improving the price mechanism; optimizing resource allocation; and ensuring the fair, open, orderly, and healthy development of the electricity market system under government supervision. The organizational restructuring of the electric power industry was accelerated, and the tariff system became more flexible. Thereafter, the focus became renewable energy development and application.

According to the Report of China's Power Development and Reform (2021), the total installed capacity of renewable energy power generation reached 930 million kW (42.4% of total installed capacity) and power generation reached 2.2 trillion kWh (29.5% of total electricity consumption); energy saving and consumption were further reduced, with the standard coal consumption for power supply reaching 305.5 grams/kWh, representing a year-on-year reduction of 0.9 grams/kWh. China's electricity system reform continued; the transmission and distribution price supervision system were perfected, and the power traded in the market exceeded 3.1 trillion kWh, representing a year-on-year increase of 11.7%.



**Figure 3.** 2011–2020 national electricity power structure of China (unit: %).

(<https://baijiahao.baidu.com/s?id=1696914394483076019&wfr=spider&for=pc>)

Twenty years of reform has led to major changes in the organization of China's electric power industry. At present, the power generation business in China is mainly managed by five major power generation groups, namely Hua neng, Da tang, Hua dian, Guo dian, and China Power Investment. Each group has its own electric power scientific research institute, which is responsible for providing specialized guidance, assessment, evaluation, and feedback and implementing continual improvements to the transformation of safety production and environmental protection technologies utilized by the group's power generation enterprises. Each institute has a comprehensive institutional set-up with special safety and environmental protection departments and planning departments. Furthermore, each province also has its own group power generation companies. For example, Jiangsu Province has four power plants. In 2020, Jiangsu was listed as a key unit of the Group's “world-class specialized company” and was awarded the Advanced Enterprise in Safety and Environmental Protection award; the four power plants were all awarded the First-Class Safety and Environmental Protection award.

## 4.2. Barriers

### 4.2.1 Barriers to implementation of OHS management

Two types of barriers are identified, namely objective and subjective barriers. Objective barriers relate to the complex working conditions in the electricity industry. For example, complex frontline working environments such as those in which circuit overhaul is conducted are dangerous and affected by problems including bad weather. Furthermore, occupational health hazards and risk factors cannot be fully identified. Subjective barriers can be subdivided into four levels by applying the New St. Gallen Management model. In the environmental sphere, law enforcement is less strict, such that private contractors, subcontractors, and outsourcing companies can ignore related laws and regulations for financial purposes. They may hire low-wage workers who lack the relevant knowledge and skills, implement inadequate safety measures, and fail to meet safe production requirements with respect to OHS protection equipment, facilities, and



workforce training. With regard to structuring forces, the occupational health management system has not yet been fully established. Some experts are concerned about the lack of a scientific management basis for OHSM because no qualified unit has been commissioned to evaluate the status of occupational diseases in the electric power industry. The ability of internal management to cope with risks is also inadequate. In fact, the participants differed greatly in terms of their opinions on OHSM depending on their positions. Most leaders and experts believed that the OHS management system is present in the electric power industry, whereas numerous frontline workers were unclear about the identity of the organization that is responsible for managing OHS and the specialized personnel that are involved in OHS management; this indicates that employees have yet to fully adopt a safety culture. At the operational level, OHS accidents are more often attributed to the lack of knowledge and ability of frontline workers, who are usually employees of outsourcing companies. The implication is that the main players in the electric power industry are affected by barriers that prevent them from implementing overall OHSM improvements. For organizational changes, during the process of marketization, the strict management system of state-owned enterprises was dismantled by private contractors, subcontractors, and outsourcing companies. Many urgent and dangerous projects were subcontracted and handled by migrant workers who lacked professional technical training. Thus, multiple forms of employment increase the difficulty and challenge of implementing safety management.

#### 4.2.2 Barriers to the implementation of CSR

Participants complained that CSR lacks broad public support, which could be due to the lack of communication within and outside of the industry. Some participants indicated that local governments and surrounding villages often use CSR as a pretext to blackmail companies by continually demanding financial compensation, which affects the normal production management of a company and creates substantial economic burdens for it. Some companies do not have specialized structures or funding for CSR. Furthermore, employees lack the awareness that CSR can enhance corporate competitiveness and promote sustainable development, which may cause conflict at work.

#### 4.2.3 Barriers to the implementation of sustainability

Insufficient human resources, unstable teams, and inadequate incentives were highlighted by many participants; some participants also complained that the market is difficult to enter due to their limited resources. Furthermore, participants' opinions varied substantially depending on their positions in their companies. Senior managers and experts were knowledgeable about the sustainable development strategy of the power industry, which includes the 13<sup>th</sup> Five-Year Plan, 14<sup>th</sup> Five-Year Plan, and Double Carbon policy and focuses more on implementing environmental protection and improving

the technological innovation capabilities of enterprises. By contrast, general employees knew less about this topic, indicating that more time and effort are required for educated employees on the aforementioned policies.

## 5. Conclusion

Improving working conditions and promoting the health, safety and well-being of workers are highly relevant to the social responsibility of business and the sustainability of enterprises. With the combined theoretical framework of New St. Gallen Management Model and stakeholder theory, semi-structured interviews as well as on-the-spot observations were carried out. It is found that the successful integration of OHSM, CSR and sustainability has been systematically achieved in China's electric power industry, which is mainly due to the rapid development of science and technology, as well as progress in rule of law. However, law reinforcement and the coherence between internal and external stakeholder management systems are expected to be improved. More professional technicians are needed for the complex frontline tasks. The communication of OHSM, CSR and sustainability outside of the industry should also be implemented to enhance the environmental sphere and public support.

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