ASSESSING THE SUSTAINABILITY MATERIALITY MATRICES OF METALLURGICAL INDUSTRY LEADERS

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Abstract

Over the last decade, sustainable development is a key strategy used by global leaders in all industries. The implementation of this strategy is regularly published through sustainability reports. The subject of the study is to analyse the preferences of the topics of sustainable development of the leading metallurgical producers. The aim is to identify those areas considered by the leaders of the metallurgical industry to be the most important for their long-term sustainable development.

Keywords: Sustainability, metallurgical industry, sustainability reports

1. INTRODUCTION

Sustainability is widely accepted as one of the most important approaches, which allows to reach a long-term success in the industry. Sustainable development is considered as a key strategy in recent times used by global leaders of all industries. The company's strategy is regularly published in the form of sustainability reports. This reporting is usually carried out according to international standards. The most often are used standards by Global Reporting Initiative (GRI), an international independent organization that helps businesses, governments and other organizations understand and communicate the impact of business on critical sustainability issues such as climate change, human rights, corruption and many others [1]. They define their key areas of sustainable development, define strategic goals and activities for them, and evaluate their performance. The article is devoted to the analysis of the preferences of areas of sustainable development of the leading manufacturers of the metallurgical industry in the world context. The aim of the paper is to identify key topics areas that the metallurgical industry leaders consider to be the most important for their long-term sustainable development and to evaluate them in terms of the principles of sustainable supply chain management.

2. LITERATURE REVIEW

2.1. Sustainability of an industrial enterprise

Sustainability is practiced globally as a comprehensive strategy for improving the sustainability performance of the manufacturing industry [2]. Although there exists a divergence of definitions of sustainability, most of them are based on the Elkington's [3] triple bottom line considering three fundamental sustainability dimensions - economic, environmental and social (e.g. definitions by Sikdar [4], Goncz [5] or Lijo and Gopalakrishnan [6])

2.2. Sustainability studies in the metallurgical industry

Sustainability issues in the metallurgical industry was studied by several authors. For example, Peng et al. [7] studied how sustainable metallurgical processes encompass new theory and techniques regarding the optimization of existing processes for improved energy efficiency, enhanced environmental benefits, and increased resource/waste/by-product utilization. The authors focused on new "cleaner" metallurgical technologies and, in this context, chose articles that in this topic exemplify how recent efforts trigger the

development of metallurgy by improving its sustainability, from basic theories through methodologies to practices.

Xiaohong et al. [8] applied the eMergy analysis to the sustainability of Chinese steel production in 1998 - 2004. According to the results presented by the authors, it was obvious that sustainability was very low and declining in this period, emissions obviously reduce the sustainability although their impacts are generally decreasing, and the main reasons lie in its low non-renewable resources and energies' efficiencies. Finally, they bring suggestions for improving its comprehensive performance.

3. RESEARCH METHODOLOGY

Global Reporting Initiative (GRI) standards for sustainability reporting were used to carry out the comparative study. The GRI standards enable organizations to measure and understand their most critical impacts on the environment, society and the economy [1]: (1) The economic dimension of sustainability concerns an organization's impacts on the economic conditions of its stakeholders, and on economic systems at local, national, and global levels; (2) The environmental dimension of sustainability concerns an organization's impacts on living and non-living natural systems, including land, air, water and ecosystems; (3) The social dimension of sustainability concerns an organization's impacts on the social systems within which it operates.

GRI defines the topic-specific standards for each dimension. Economic sustainability includes six topics, environmental sustainability eight topics, and social sustainability nineteen topics (see **Table 1**) [1].

Table 1 GRI sustainability topics [1]

Economic Dimension	Environmental Dimension
Economic Performance	Materials
Market Presence	Energy
Indirect Economic Impacts	Water
Procurement Practices	Biodiversity
Anti-corruption	Emissions
Anti-competitive Behaviour	Effluents and Waste
	Environmental Compliance
	Supplier Environmental Assessment
Social Dimension	
Employment	Rights of Indigenous Peoples
Labour/Management Relations	Human Rights Assessment
Occupational Health and Safety	Local Communities
Training and Education	Supplier Social Assessment
Diversity and Equal Opportunity	Public Policy
Non-discrimination	Customer Health and Safety
Freedom of Association and Collective Bargaining	Marketing and Labelling
Child Labour	Customer Privacy
Forced or Compulsory Labour	Socioeconomic Compliance
Security Practices	

GRI administers the GRI Sustainability Disclosure Database, which is a collection of all sustainability reports of which GRI is aware. To analyze sustainability topics, top 20 steel-producing companies were selected. The

selection criteria were: (1) The sustainability report is available in GRI Sustainability Disclosure Database or on web sites of the company; (2) The sustainability report is in the English language; (3) The report includes a materiality analysis according to GRI standards. These criteria were met by four companies: ArcelorMittal, POSCO, Tata Steel Group, and China Steel Corporation (see **Table 2**).

Table 2 Top steel-producing companies in 2016, tonnage in million tons of crude steel production [9]

Rank	Company	Country	Tonnage	Identifier	References
1	ArcelorMittal	Luxembourg	97.14	I.	[10]
4	POSCO	South Korea	41.97	II.	[11]
10	Tata Steel Group	India	26.31	III.	[12]
19	China Steel	Taiwan	15.50	IV.	[13]

As a basic approach to the analysis of preferences, the analysis of the so called materiality matrices was chosen [14, 15]. Within this, the companies themselves identify the most important (key) areas of sustainability. The materiality matrix allows the assessment of a wide range of possible topics in terms of the significance of the economic, environmental and social impacts of the organization and the impact on stakeholder evaluation and decision making [1, 16]. The materiality matrix is shown in **Figure 1**. The key topics are the ones that show high economic, environmental and social impacts and high impact on stakeholder assessment and decisions. The analysis was based on the categorization of the key topics identified by individual companies in terms of GRI topics defined by GRI standards. The GRI topics with the most frequent occurrence are considered to be the most significant.

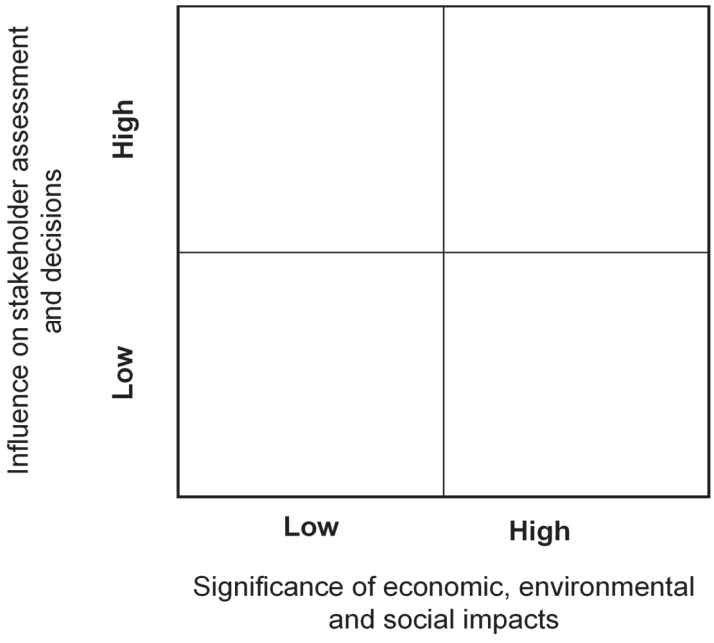

Figure 1 Materiality matrix [1]

4. RESULTS AND DISCUSSION

The key sustainability topics identified by the companies studied are listed in **Table 3**. In the “No. of key topics” is presented the overall number of topics which was identified by a given company in the frame of the materiality analysis as well as in the number of topics which is considered as being the key ones. The table makes it obvious that the number of the identified and also the key topics differs quite significantly.

Table 3 Key sustainability topics in studied companies

Company	No. of key topics	Key topics
I: ArcelorMittal	11 key topics from 23 significant topics	Occupational health and safety
		Training and education
		Emissions
		Employment
		Economic performance
		Local communities
		Fighting corruption
		Water
		Energy
		Biodiversity
		Effluents and waste
II: POSCO	19 key topics from 46 significant topics	Management's (financial results including revenue, operating profit)
		Innovation management and cost reduction
		R&D (e.g. R&D expenses, research and development, technology development)
		Corporate governance (appointment of CEO)
		M&A and restructuring of group companies
		Customer relationship management (customer satisfaction, quality management)
		Climate change (GHG and energy management)
		Risk management (financial and non-financial integration management)
		Safety (accident cases, lost-time injury frequency rate) / health
		Environmental management policy
		Water management
		Communication with stakeholders
		Product quality
		Corporate ethics/anti-corruption
		Social contribution program (support for multicultural families, steel house construction)
		Employee satisfaction
		Human resource development
		Women's rights and diversity
		Community involvement (employment of local residents and social contribution to local communities)

Continue

Company	No. of key topics	Key topics
III: Tata Steel Group	11 key topics from 19 significant topics	Promoting ethical behavior
		Stakeholder Identification & Management
		Resource consumption
		Emissions
		Land acquisition and R&R (operations to be commissioned)
		Community engagement and satisfaction
		Environment performance management
		Occupational health & safety
		Capacity building of employees
		Local infrastructure development
		Leadership policy and oversight on sustainability
IV: China Steel Corporation	16 key topics from 35 significant topics	Sustainable development strategy
		Operational financial performance
		Product quality/technology R&D
		Corporate governance
		Air pollutants
		Water use and waste sater discharge management
		Waste management
		Energy consumption and management
		Hazardous substance control
		Environmental policy/management system
		GHG emissions
		Material use and recycled materials
		Occupational safety and health
		Labor/management relations
		Employee welfare and salary
		Talent recruitment and retention

The results of the materiality matrix analysis are shown in **Tables 4** to **7**. The tables include only the GRI sustainable topics that the companies studied considered to be key (other topics are listed in **Table 1**). The individual key topics were assigned to the GRI topics. In some cases, one key topic falls into several GRI topics or, on the contrary, several key topics fall under one GRI topic. Certain key topics could not be assigned to any of the GRI topics. These topics are referred to as "other" and are listed in **Table 7**.

Table 4 Results of the materiality matrices analysis for economic dimension

Economic topics	Company			
	I	II	III	IV
Economic Performance	Economic Performance	Management's		Operational financial performance
Indirect Economic Impacts			Local infrastructure development	
Anti-corruption	Fighting corruption	Corporate ethics/anti-corruption	Promoting ethical behavior	

Table 5 Results of the materiality matrices analysis for environmental dimension

Environmental topics	Company			
	I	II	III	IV
Materials			Resource consumption	Material use and recycled materials
Energy	Energy	Energy management		Energy consumption and management
Water	Water	Water management		Water use and waste water discharge management
Biodiversity	Biodiversity			
Emissions	Emissions	GHG management	Emissions	Air pollutants / GHG emissions
Effluents and Waste	Effluents and Waste			Waste management
Environmental Compliance		Environmental management policy	Environment performance management	Hazardous substance control / Environmental policy/management system

Table 6 Results of the materiality matrices analysis for social dimension

Social topics	Company			
	I	II	III	IV
Employment	Employment	Employee satisfaction	Capacity building of employees	Employee welfare and salary
Labor/Management Relations				Labor/management relations
Occupational Health and Safety	Occupational health and safety	Safety / health	Occupational health & safety	Occupational safety and health
Training and Education	Training and education	Human resource development		Talent recruitment and retention
Diversity and Equal Opportunity		Social contribution program / Women's rights and diversity		
Local Communities	Local communities	Community involvement	Community engagement and satisfaction	

Table 7 Results of the materiality matrices analysis for other dimension

Other topics	Company			
	I	II	III	IV
Innovations and R&D		Innovation management and cost reduction / R&D / Product quality		Product quality/technology R&D
Corporate Governance		Corporate governance		Corporate governance
Mergers and Acquisitions (M&A)		M&A and restructuring of group companies		
Customer Satisfaction		Customer relationship management		
Risk Management		Risk management		
Communication with Stakeholders		Communication with stakeholders	Stakeholder identification & management	
Sustainable Development Strategy			Leadership policy and oversight on sustainability	Sustainable development strategy
Land Acquisition and R&R			Land acquisition and R&R (operations to be commissioned)	

The identification of the key topics, which are among the most preferred metallurgical industry leaders, was made on the basis of the frequency of occurrence. The following occurrence values have been chosen as

threshold: (1) Very important topic - 3 or more occurrences (over half the occurrences); (2) Important topic - 1 or 2 occurrences, (3) Unimportant topic - zero occurrence. The results obtained can be summarized as follows:

Economic topics: (1) Very important topics: Economic Performance and Anti-corruption; (2) Important topic: Indirect Economic Impacts; (3) Unimportant topics: Market Presence, Procurement Practices and Anti-competitive Behavior.

Environmental topics: (1) Very important topics: Energy, Water, Emissions and Environmental Compliance; (2) Important topics: Materials, Biodiversity and Effluents and Waste; (3) Unimportant topic: Supplier Environmental Assessment.

Social topics: (1) Very important topics: Employment, Occupational Health and Safety, Training and Education, and Local Communities; (2) Important topics: Labor/Management Relations and Diversity and Equal Opportunity; (3) Unimportant topics: Non-discrimination, Freedom of Association and Collective Bargaining, Child Labour, Forced or Compulsory Labor, Security Practices, Rights of Indigenous Peoples, Human Rights Assessment, Supplier Social Assessment, Public Policy, Customer Health and Safety, Marketing and Labelling, Customer Privacy, and Socioeconomic Compliance.

Others topics: (1) Very important topics: no topic was assigned to this group; (2) Important topics: Innovations and R&D, Corporate Governance, Mergers and Acquisitions (M&A), Customer Satisfaction, Risk Management, Communication with Stakeholders, Sustainable Development Strategy, and Land Acquisition and R&R.

In the overall context, the most important topics are Emissions, Employment, and Occupational Health and Safety, which belong among the key topics in all studied companies.

5. CONCLUSION

The comparative study of sustainable topics in the metallurgical industry allows to identify the most important topics in the economic, environmental, and social sustainability dimensions. Economic performance is the most important topic in the economic dimension because it has been a critical success factor of each metallurgical company for many years. However, a great emphasis is also placed on the anti-corruption behavior.

The analysis of the environmental dimension indicates that the dimension is very crucial for the metallurgical industry due to very serious negative impacts on the environment, especially in the areas of emissions release, energy and water consumption, and environmental compliance.

Employee aspects are very important for the social dimension. Employment is underlined because the industry belongs among the largest industrial employers. The health and safety area is crucial since the metallurgical operations have an increased risk of injuries and/or fatalities. Training and education is also an important factor for internal sustainability of metallurgical companies. Local communities support its importance, because large metallurgical companies have a major influence on the region in which they operate.

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