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Sustainable Cement Production: Exploring the Interplay of Social Efficiency, Worker Health, and Labor Equity

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ABSTRACT

This research study undertook a thorough examination of the social efficiency within the cement sector in Kashmir. The study specifically concentrated on three crucial indicators of social sustainability, namely the health of workers, equity and diversity, and fair labor practices. By utilizing Partial Least Squares Structural Equation Modeling (PLS SEM) and conducting a study with a sample size of 272 employees from all operational cement plants in the region of Kashmir, our research revealed a strong and statistically significant relationship between social efficiency and key factors such as workers' health, equity and diversity, and fair labor standards. The aforementioned findings highlight the importance of fostering a socially responsible and sustainable cement business in the area, which has significant implications for improving both economic and social welfare.

Keywords: Social efficiency, Cement Industry, Worker's health & Safety, Fair Labor, Equity & Diversity, Kashmir.

1. Introduction:

Efficiency, a pillar of modern success, refers to the efficient use of resources to generate maximum output with minimal input ter Bogt, H.J. (2021). It is a crucial notion that resonates across numerous businesses, but its importance in industries is most pronounced MR Daniels (1969). Efficiency becomes the key for growth, sustainability, and global competitiveness in the context of industries coelli et, al (1988). Businesses and organizations are constantly striving to improve their operational efficacy since it has a direct impact on productivity, cost-effectiveness, and profitability Wildavsky A (1966). Increasing industry efficiency requires optimizing processes, embracing novel technology, and cultivating a culture of continual improvement Callejon & Segara (1999). Embracing efficiency becomes a mission-critical need for fostering economic success and environmental sustainability in the face of growing demands in a fast-moving society Kang & Lee (2016).

While industries are primarily concerned with economic efficiency, the wider concept of social efficiency extends beyond financial measures Louis & Thomas (2007). The capacity of society systems to distribute resources properly in order to maximize the overall welfare and well-being of individuals and communities is referred to as social efficiency Burger and Humphrey (1997). It entails equitable resource allocation, the mitigation of negative externalities, and the consideration of broader society implications beyond profit margins San et, al. (2014). In essence, social efficiency addresses the task of establishing an inclusive and sustainable society in which economic advancement is balanced with social fairness and environmental stewardship Anda & Andreea (2013).

Industries can reduce negative externalities such as environmental degradation, worker exploitation, and economic inequality by boosting social efficiency, while maximizing positive outcomes such as job creation, sustainable development, and higher living standards Lebovics et, al (2016). Adopting social efficiency not only improves a company's reputation and stakeholder trust, but it also adds to societal progress and peace, promoting a sustainable and inclusive future for future generations Dominique & Yannic (2017). The expectations of society

about the function of business have changed over the past few decades, giving them more accountability in creating a new development model (Frankental, 2001; Nelson, 2004). Organizations are anticipated to effectively address their risks while not solely focusing on mitigating the adverse effects and negative externalities resulting from their activities on the environment, society, and stakeholders. Instead, they have the opportunity to generate and enhance value by capitalizing on their positive contributions to the communities in which they operate. Dodd 1932. Socio-efficiency advocates for the inclusion of the relationship between a firm's value added and its social impacts, suggesting that negative social impacts should be minimized while good social impacts should be maximized in connection to the value created for the companies (Dyllick and Hockerts, 2002).

1.1. Cement Industry overview

Cement manufacture has advanced dramatically since its inception approximately 2000 years ago Baurer & Hoenig (2010). Despite the lengthy history of cement use in concrete, industrial manufacture of cements only commenced at an intermediate stage of nineteenth century, first with shaft kilns, which were eventually superseded as standard equipment globally by rotary kilns Bohm & Pierkes (2009). One of the most essential building materials in the world is cement. It is mostly utilized to make concrete. Sand, gravel, crushed stones, cement, and inert mineral aggregates are the main components of concrete. Due to the importance of its products to the construction sector and to the country's gross domestic product, the cement industry is crucial to the global economy (Ishaq & Hashim 2015). Since the previous two decades, there has been an exponential rise in the demand for cement and concrete on a global scale due to a number of significant, ongoing trends, including the rising population and the rising demand for infrastructure and housing (Kajaste & Hurme 2016). As a result, this need has been met by expanding cement facilities, increasing raw material extraction, consuming more fossil fuels, and having a negative impact on the environment (Deja et, al., 2010).

1.2 Cement industry in India

In 1914, India Cement Company Limited opened the country's first cement mill in Porbandar, Gujarat. Following this, two further cement plants were built, one in Rajasthan's Lakheri and the other in M.P.'s Katni. The cement industry received a much-needed boost from World War I, which resulted in the construction of six new plants in 1922–1923 with a production capacity of 5.59 lakh tons. There were about 11 cement companies in 1934, of which 10 combined to form Associated Cement Co. Ltd. The Dalmia Cement Group was established in 1937 and built facilities in Punjab, Tamil Nadu, and Bihar. According to a conservative estimate, around 11 different types of cement are produced in India, the most important of which are Ordinary Portland Cement (OPC), Portland Pozzolona Cement (PPC), and Portland Blast Furnace Slag Cement (PBFC), which account for approximately 99% of total cement production. Blended cement (PPC and PBFC) represents a small but increasing percentage of India's cement manufacturing. The cement industry in India provides several economic benefits that greatly contribute to the country's growth and development. The industry creates significant employment opportunities, both directly and indirectly, in the manufacturing, distribution, and construction sectors, increasing income levels and lowering unemployment.

1.3 Kashmir's cement industry: Salient Characteristics

The northern Indian union territory of Jammu and Kashmir's economy is based mostly on tourism, although it also has a thriving manufacturing and industrial sector. Government of India has provided unique incentives in the form of tax breaks to entice investment in the industrial sector in states with a low level of industrialization, such as Utarakhand, Himachal Pradesh, Jammu and Kashmir, etc. (Mehraj et, al. 2013). In order to make Jammu & Kashmir an independent state, the government has been allocating more money to this industrial hub. In all of the districts of the UT of Jammu and Kashmir, there are significant and diverse mineral reserves. Various minerals such as coal, lignite, bauxite, limestone, and gypsum, among others, possess potential for utilization in commercial applications. (Ashraf & Balla 2018).

The cement industry in Kashmir, which is part of the greater Jammu and Kashmir union territory in India, has grown gradually over the years. Natural resources in the region, such as limestone and gypsum, have been critical in the creation of cement manufacturing operations (Dar & GH 2006). Kashmir's cement industry has been around for several decades. Early cement production plants were constructed in localities such as Khrew and Khonmoh there are now nine functioning cement plants in the specified location. (Mansoor et, al 2020). The region is

abundant in limestone, a vital raw ingredient in cement manufacture. Limestone is mined and processed to form clinker, which is subsequently pulverized into cement (Shakeel et, al 2015). The availability of resources has been a crucial element in the growth of the cement industry. The installation of cement facilities in the region has aided industrial growth and job creation in Kashmir (Ashraf & Bhat, 2013). These plants not only manufacture cement for local construction needs, but they also contribute to the area's overall economic development. Kashmir cement is used in a variety of infrastructure projects, including the construction of buildings, roads, bridges, and other vital structures (Nagpal et al., 2024). As a result, the general growth of the region's infrastructure is aided. Like any other industry, the cement industry has experienced regulatory compliance, environmental issues, and market swings. A priority has been to balance industrial growth with environmental sustainability. As per the department of geology and mining nine plants are operating in Kashmir located in Khrew and Khanmoh area of Pulwama out of which three plants Khyber, TCI & Saifco are located in Khanmoh and rest are in Khrew.

Table 1 Operational Cement plants in Kashmir:

S.No.	Name of Mine	Location village & district	Area (Hectare)
01	M/S Khyber industries	Tulpaw village Khanmoh, **District, Srinagar**	77.96 ha
02	M/S Saifco Cements	Samman village Khonmoh, **Srinagar**	1.4425 Sq. Kms.
03	M/S Khyber PVT. LTD.	Village Sekinar, Khonmoh **Srinagar**	14.93 ha
04	M/S H K cements	Qutargan zantrag Khrew Tehsil pampore **Pulwama**	4.460 ha
05	M/S Cemtac cements	Salina Satur marg Khrew, **Pulwama**	29.4151 ha
06	M/S TCI cements	Gunsnar bajarnar Wuyan **Pulwama**	44.00 ha
07	M/S TCI MAX	Bathan Khrew **Pulwama**	4.92 ha
08	M/S Valley cement industry	Kutmarg Khrew pampore **Pulwama**	3.82 ha
09	M/S Arco Cements	Zantrag pampore **Srinagar**	65.9 ha

Source: Department of geology and mining

Cement plants have long been seen as essential contributors in industrial development, promoting economic expansion and creating job opportunities all over the world. In the context of Kashmir, however, the creation and operation of cement mills has become a contentious subject, provoking heated debate among stakeholders. Supporters of these factories emphasize the positive elements, claiming that they provide economic growth and alleviate unemployment. Opponents, on the other hand, cite reasonable worries about environmental issues and potential harm to the region's delicate ecosystem. Given this continuous problem, it is critical to examine the social, economic, and environmental ramifications of these factories in order to gain a thorough knowledge of their total impact. Historically, the cement industry's emphasis on economic and environmental elements has frequently eclipsed its misunderstanding of the critical social dimension. While economic forces drive manufacturing and environmental concerns promote sustainability, the industry's social impact remains underappreciated. Neglecting this dimension ignores the well-being of communities surrounding cement plants by ignoring issues such as health hazards, displacement, and labor rights. To achieve true sustainability, the cement sector must recognize and interact with societal complexities, balancing economic growth and environmental stewardship with social equality and inclusivity.

The purpose of this article is to investigate the social efficiency of the cement business in Kashmir, investigating its contributions to the community and assessing its implications for the region's social fabric. A quantitative assessment was conducted to evaluate the social efforts of cement organizations in the Kashmir Valley. Information was collected through a standardized questionnaire to determine the extent to which social efficiency is included within these organizations. Variables have been chosen through GRI guidelines. The United Nations Environment Programme (UNEP) and Environmental Responsible Economies (CERES) collaborated to create the GRI (GRI 2002, 2015) framework for sustainable leadership. With respect to its three main priority areas—

social, economic, and environmental GRI employs a hierarchical framework. The sustainability categories, along with their dimensions and indicators, are further described in the three domains. The GRI standards specify which dimensions ought to be taken into account for a specific category. Revelations are described using GRI principles in a number of working areas as well as at the overall organizational level (Labuschagne et al. 2007).

The research will look into a variety of topics, including community development, workers health and safety, fair labor and equity & diversity. Policymakers, stakeholders, and concerned citizens can get significant insights into sustainable economic growth in the region by critically examining the social efficiency of the cement area in Kashmir. Understanding the industry's social impact strengths and weaknesses can lead to initiatives that maximize advantages for local communities while minimizing negative consequences. Furthermore, this research could aid in the identification of best practices and policy interventions to promote an inclusive and socially responsible cement sector in Kashmir.

2. Literature Review

2.1 Social Efficiency

The unsettled nature of the efficiency of industries is a significant concern; there is a gap in the literature on industrial efficiency, at least in terms of the social perspective of efficiency (Goiria et, al 2017; Bibi et, al 2018). Our strategy is predicated on continued contributions in this area. In the present context, the concept of social efficiency is understood as the equilibrium between the allocation of resources towards the objectives of an organization and the generation of societal value through the utilization of those resources, as per the principles of the Pareto social optimum. (Chang A F 2000; Elkington J 1994). Equity and outside finance are examples of such resources, while loan amounts, clientele, or economic sustainability are resources that can benefit stakeholders (Belki et, al 2016). In this sense, an organization is thought of as a group of stakeholders who share a common goal; as a result, the social efficiency of an organization is determined by the profits generated for its stakeholders, minus any unfavorable externalities (Freeman 1984; Galema & Koetter 2016; Chortareas et, al 2013).

It might be challenging for managers to examine an industry's sustainability accomplishment in the perspective of the social component (Aliakbari et al., 2019). Currently, industrial managers utilize a majority of business models that apply cost-related metrics and quantitative criteria. However, it is not explicitly promoted to achieve social aims (Govindan et al., 2021). Some recent empirical studies are attempting to assess the social performance of industries such as Khokhar et al. (2020); Yıldızbaşı et al. (2021) and Hendiani et al. (2021). To the best of our knowledge, no literature pertaining to the cement business has taken into account forecasting the effect of cement output on social performance. By taking care of these relationships, industrialists may be able to prioritize and budget for them consciously Reefke & Sundaram, (2017). Industrialists require an expert system that enables them to investigate the effects of their choice to implement various social practices on the accomplishment of social sustainability Hussein et al., (2016); Tseng et al., (2018). This is a crucial criterion of recent literature that merits researchers' attention in order to create more useful solutions (Wang et al., 2015; Eskandarpour et al., 2015). Researchers and practitioners note that, of the three sustainability factors environmental, economic, and social sustainability social aspect is comparatively little practiced, debated, and developed (Mani et al. 2016; Vallance et al. 2011). The existing body of literature highlights a notable absence of a comprehensive conceptual framework for evaluating and addressing social sustainability, specifically within the manufacturing and operations domain in developing nations such as India. (Gopal and Thakkar, 2015; Dempsey et al. 2009).

2.2 Cement Industry and Efficiency

India, a developing nation with one of the wildest expanding economies, must balance resource consumption with economic growth in order to distribute resources fairly to all stakeholders. In order to stay socially responsive to multiple stakeholders regarding the use of resources, capabilities, and distribution of financial advantages, decision-makers must develop frameworks in order to effectively oversee not only their internal resources and capabilities, organizations must engage in strategic management practices. (Mani et al. 2016; Campbell 2007; Sodhi 2015). The significant advancements in industrial efficiency are demonstrated by the cement sector (J Harder 2006). Nevertheless, some researchers (Muller & Palm 2011; puntke & Schneider 2008;) claim that with unmatched efficiency, cement industry has transformed raw materials into a crucial component of contemporary infrastructure through ongoing innovation and technological improvements. The cement industry has embraced

sustainability and resource optimization, from improved production procedures that reduce energy consumption and waste generation to the creation of alternative and eco-friendly cement compositions (Wang, 2020; Habert et al., 2020; Ighalo and Adeniyi, 2020).

It is clear from a thorough survey of the literature at hand that the environmental and financial impacts of the cement industry have been the subject of a sizable body of research. Numerous studies have examined the energy use, emission profiles, and ecological impact of cement manufacture. Equally noteworthy, though, is how little focus this industry's social component receives (Hossain, 2005; Malhotra, 1993; Shariq et al., 2008; Siddique and Klaus, 2009; Wang et al., 2018). There is an intriguing vacuum in the investigation of the social ramifications, such as labor conditions, community engagement, and the overall societal impact of cement manufacturing, even though environmental and economic issues have gained primacy. This emphasizes the necessity for more study that thoroughly covers all facets of the cement industry's influence.

H1: There is significant relationship between workers' health & safety and social efficiency

2.3 Social efficiency and Worker's health:

The health and safety of employees in the cement industry is undoubtedly a crucial issue that has been investigated and discussed in a number of literary sources. In any industrial process, workers may encounter various physical, chemical, and biological agents or materials that present potential health hazards. Three recurring risk exposures in the cement industry are dust, dust that contains Respirable crystalline silica, and noise (WBCSD, 2015). Because of the rapid industrialization, environmental anxiety is also a worry. (Stafford et al, 2015). Several occupational dangers are present in cement production and processing. (Rampuri, 2017). The greatest risk is posed by the fine dust that is generated throughout various stages of cement manufacture (Neghab et al., 2017), especially in crushing and packaging (Zeleki et al., 2010). When breathed in or in contact with, cement dust irritates the skin and eyes because of its alkaline makeup. (Erah et al., 2018). Everyone is aware that humans depend on the basic needs of air, water, shelter, and soil to survive. (Nadeem et, al., 2015). Breathing in cement dust can have a number of effects on the respiratory system, according to Nikhama et al. in 2022. whereas a persistent link between the exposure and phlegm, a cough, wheezing, shortness of breath, etc. (Bianchi,2007). When cement is made, significant volumes of SO2, NOx, and CO are created. These pollutants are harmful to human health. (Bermudez, 2010). The most vulnerable populations are believed to be small children, the elderly, and those who have underlying respiratory problems like bronchitis, emphysema, or asthma. (Etim et al., 2021).

Making sure that cement industry employees have safe and healthy working conditions is a crucial problem, and several businesses agree that the entire sector should pay greater attention to this area (Rehman et al., 2023). In comparison to other industries like petrochemicals and petroleum refining, the cement industry has a greater rate of fatalities and injuries (WBCSD, 2013). Although executives think that training is the most important safety intervention, Nahrgang et al. (2010) argue that businesses should think about making their workplaces more welcoming to workers. Workers who are educated and well-trained are essential to the sustainable manufacture of cement, whether they are employed in cement factories or further up the value chain at construction firms that use the product. Only by utilizing highly effective training programs will be the contest of lowering energy and raw material consumption while still adhering to excellence, presentation, and price necessities in the situation of the enormous petition for cement as a building substantial in the forthcoming be overcome (Schneider et al., 2011). Additionally, it is critical that state environmental officials possess the practical ability to guarantee that businesses engage in co-processing without jeopardizing the well-being of employees and communities residing nearby (Rehman et al., 2024). An investment in personnel and facilities to boost these institutions' institutional capability seems important to mitigate this problem (Lamas et al., 2013; Pinto Junior et al., 2009). The cement manufacturing will only be able to more minimize the ecological impact of its processes and its products in their final applications with experience and know-how, as well as ensure the security of the employees and the communities existing around the plants (Lamas et al., 2013; Milanez, 2007; Pinto Junior et al., 2009; Schneider et al., 2011). According to a evaluation of the literature, more research is still needed to understand how cement industry employees perceive not lone health-related matters but also sustainability in relation to co-processing, workplace safety, community transparency, and active citizen contribution in decision-making.

H2: significant relationship between equity & diversity and social efficiency

2.4 Social efficiency and equity & diversity

The objectives of social efficiency, justice, and diversity are frequently regarded as mutually reinforcing aims. Social efficiency is a concept that pertains to the optimal circulation of resources and chances within a society, with the aim of maximizing the total welfare and productivity of that society Arrow, K. J. (1951). The concept of equity is centered on the objective of guaranteeing impartiality and righteousness in the allocation of resources and opportunities Pigou, A. C. (1920). Conversely, diversity places emphasis on the incorporation and portrayal of diverse demographic groups. The presence of diversity within a social context has the potential to enhance overall efficiency by promoting the development of innovative ideas and establishing a climate conducive to creativity Rawls, J. (1971). The convergence of varied viewpoints, backgrounds, and experiences has the potential to foster enhanced innovation and decision-making capabilities, hence enhancing overall social efficiency (Akula et al., 2024). The presence of diversity within a social context has the potential to enhance overall efficiency by promoting the development of innovative ideas and establishing a climate conducive to creativity Sen, A. (1980). The convergence of varied viewpoints, backgrounds, and experiences has the potential to foster enhanced innovation and decision-making capabilities, hence enhancing overall social efficiency. The promotion of fairness and diversity has the potential to mitigate instances of prejudice and bias in society Cox, T. (1994). Discrimination and bias pose significant obstacles to achieving social efficiency, as they engender inefficiencies by perpetuating exclusionary practices that prevent highly skilled persons from accessing opportunities based on irrelevant attributes such as race or gender Feldstein, M. (1974).

The presence of more justice and variety within civilizations has the potential to yield economic advantages (Rehman & Dhiman, 2022). The achievement of social efficiency is closely associated with the establishment of equitable access to education, employment, and opportunities for all individuals within a given society Jackson, S. E., & Ruderman, M. (1999). This inclusive approach fosters a more productive and wealthy society, as it enables the full utilization of human potential and the optimization of societal resources Manski, C. F. (1993). The pursuit of social efficiency, in the absence of due consideration for justice and diversity, may give rise to social unrest and pose challenges to long-term sustainability. The failure to address the needs and uphold the rights of marginalized groups can lead to social and economic instability, ultimately compromising long-term societal efficiency Alesina, A., & La Ferrara, E. (2000).

H3: There is significant relationship between fair labor and social efficiency.

2.5 Social Efficiency and Fair labor.

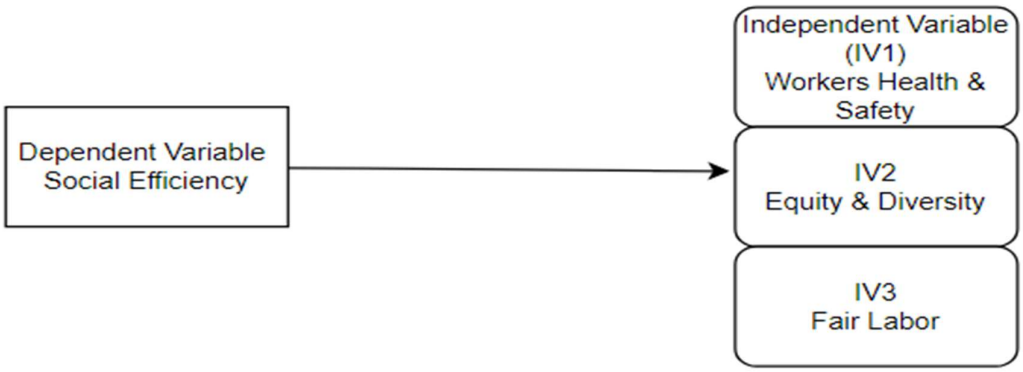
The implementation of equitable labor practices, encompassing the provision of just compensation to workers and the establishment of secure working environments, has the potential to enhance the overall efficacy of the labor market (ILO). When workers are subjected to fair treatment, there is a higher likelihood of increased motivation, productivity, and overall well-being, hence resulting in elevated levels of labor productivity. Fair labor practices are congruent with the objective of social efficiency since they foster the welfare of workers and their families Freeman, R. B., & Medoff, J. L. (1984). When workers receive equitable compensation and are provided with benefits such as healthcare and retirement plans, their dependence on social safety nets is diminished, hence alleviating the strain on government resources Peck, J. (2018). The promotion of equitable labor practices can also serve as a catalyst for the attainment of sustainable economic growth. Through the prevention of labor exploitation and the reduction of income inequality, societies have the potential to attain a more equitable distribution of wealth Stiglitz, J. E. (2012). This, in turn, has the capacity to increase economic activity and enhance consumer spending. The inclusion of fair labor practices within the framework of social efficiency considerations is of utmost importance in ensuring the long-term sustainability of a system Sen, A. (1999). The utilization of labor practices that exploit workers, such as the employment of children or the provision of unsafe working environments, has the potential to incite social upheaval and result in enduring economic and reputational harm to both firms and nations. The principles of social efficiency and fair labor are inherently interrelated and ideally should be mutually reinforcing Arrow, K. J. (1951). The promotion of equitable labor practices within an economy can have a positive impact on social efficiency by improving overall wellbeing, fostering economic growth, and ensuring sustainability. Nevertheless, attaining an optimal equilibrium between these two objectives frequently necessitates meticulous examination of distinct economic, social, and cultural circumstances.

3. Gap of the study:

Recent years have seen a significant increase in the corpus of literature already written about the cement industry, with a strong emphasis on its economic and environmental aspects. Numerous studies have examined how economically viable cement production methods are as well as the effects they have on the environment. The sociological factor, particularly in the context of areas with distinct socio-political dynamics, such as Kashmir, has been notably underexplored, which highlights a key gap in the study landscape. Understanding the social effects of the cement business is equally important, even though the economic and environmental aspects are unquestionably important. Industrial operations can be tightly woven into any region's social fabric, affecting the local population's livelihoods, cultural heritage, and general well-being. The effect of the cement industry on Kashmir's social dynamics warrants serious consideration given the region's specific socio-cultural identity and historical complexity.

By conducting a thorough investigation of the social aspects of the cement business in Kashmir, this study aims to close this gap. This study intends to provide light on the intricate ways in which the cement sector interacts with the local social fabric by probing the lived experiences of local communities, the perspectives of industry workers, and the wider societal ramifications. By doing this, it hopes to offer a more comprehensive picture of the industry's effects, one that takes into account both its intricate social repercussions and its economic and environmental effects.

Figure 1: Conceptual Model



Source: Author's Own

Variables and measures

4. Research Methodology:

To test the hypothesis and understand the social efficiency of cement industry, quantitative research was designed using structured questionnaire. Prior to the commencement of data collection, the item development procedure was diligently adhered to, encompassing three distinct steps, namely, item generation, refinement, and scale validation (Levine, 2005) To facilitate the process of item production, a comprehensive evaluation of relevant literature pertaining to past studies was conducted (Andre et, al 2018; Syed et, al 2013; Fahimeh et, al 2023; Amrinder & Puja 2018). Furthermore, the development of the build and scale was enhanced through consultation with 10 academicians, consisting of six academicians and four industry specialists.

The research employed the Partial Least Square Structural Equation Modelling (PLS-SEM) methodology, utilizing the Smart PLS-3 software. Partial Least Squares Structural Equation Modeling (PLS-SEM) is a robust and validated approach utilized in the estimation of intricate cause-effect relationship models within the field of management research (Gudergan et al., 2008). The study employed a systematic random sampling technique. The

target population of the research constituted the number of labors in the cement plants of Kashmir. Total number of labors in all cement plants of Kashmir is 938 this data was collected through researchers own survey shown in table 2 out of 938 labors 272 sample has been selected by using Krejcie and Morgan formula.

Krejcie & Morgan (1970) formula:

$$s = \frac{X^2 Np(1-p)}{d^2(N-1) + X^2 P(1-P)}$$

- S= required samples
- X^2= the table value of chi square for 1 degree of freedom at the desired confidence level (3.841).
- N= Population size:
- **P=** the population proportion (assumed to .50 since this would provide the maximum sample size).
- d= the degree of accuracy expressed as a proportion (.05).
- S= (3.841) (938) (0.5) (1-0.5) ÷ (0.05^2) (938-1) + (3.841) (0.5) (1-0.5)
- = 3602.85 (0.5) (0.5) ÷ 0.0025 (937) + (3.841) (0.5) (0.5)
- = 3602.85 (0.25) ÷ 2.34 + 0.96
- =900.71 ÷ 3.3 = 272
- Approximately: 272 sample size.

Table 2 Sample size

Sr. No	Name of plant	Number of Labors
01	Khyber Cements	140
02	Arco Cements	136
03	Khyber Ltd.	112
04	TCI	127
05	TCI Max	110
06	Saifco Cements	105
07	Valley cements	85
08	Cemtac cements	76
09	H.K Cements	47
		Total: 938

Source: Author's Own Survey

Table 3: Description of the variables within the research model.

Variable Name	Code	Statements	Scale
Dependent Variable Social Efficiency			
Independent Variables			
Workers Health & Safety	WHS1 WHS2 WHS3 WHS4 WHS5 WHS6 WHS7 WHS8 WHS9 WHS10 WHS11 WHS12	Cement industry is causing health problems. Due to cement dust do you suffer from any Respiratory complications? Taking medicine for breathing problem Workplace health and safety is considered extremely important. There is an active health and safety committee Every one receives compulsory health a Safety training. Personal protection equipment (PPE) is Provided by management. Management Provides health insurance policies Safety inspection is done on regular basis. Pure drinking water facility at the workplace. Availability of clean toilets at the workplace. Cement dust is causing pollution and deteriorating air quality.	Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree.
Equity & Diversity	ED1 ED2 ED3 ED4 ED5 ED6 ED7 ED8 ED9 ED10 ED11 ED12 ED13 ED14 ED15	There is diverse environment in this cement plant Management is hiring worker/labors from all communities HR and management of the plant are supportive towards disabled people Comfortable in discussing social & cultural background with teammates Comfortable in sharing concerns with managers and supervisors Rehabilitation packages for displaced workers Faced discrimination in workplace due to cultural background Management educates the workers regarding equity and diversity. There are policies and producers to prevent and address discrimination Faced retaliation for reporting discrimination from the management The management team handles the matters related to equity satisfactorily Accommodation facility is provided by the management. Subsidized education facility is provided for workers children Harassments are addressed through sexual harassment cell. Labors are valued and respected by the community.	Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree.

Fair Labor	FL1 Satisfied with my salary/Wages FL2 Salary/Wages provided on time FL3 Receive rewards and recognition for best performance from the owner FL4 Satisfied with the support from HR department FL5 Get motivation from the management FL6 Provident fund facility is provided by management FL7 Gratuity is paid at the end of the service FL8 Tripartite relationship between employer, employee and union exists FL9 Job security exists in the plant FL10 The management involves in decision making which is relevant to my department FL11 work more than 7 hours in a day FL12 Have fewer working hours in winter FL13 Have more working hours in summer FL14 Working overtime. FL15 Get incentive for overtime work FL16 Leave Management provides paid leave once in a month FL17 Maternity leave of 26 months is provided FL18 Menstrual leave is provided FL19 Medical facilities provided by the management FL20 Residential facilities provided by the management FL21 Management team always listen grievances through Grievance Redressal cell.	Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree.

5. Data Analysis and Results:

Starting with the hypotheses that have been developed, we use partial least squares and the structural equation modelling to construct a model. Figure 2 depicts the model that was created after the variables were defined, as indicated in Table 3.

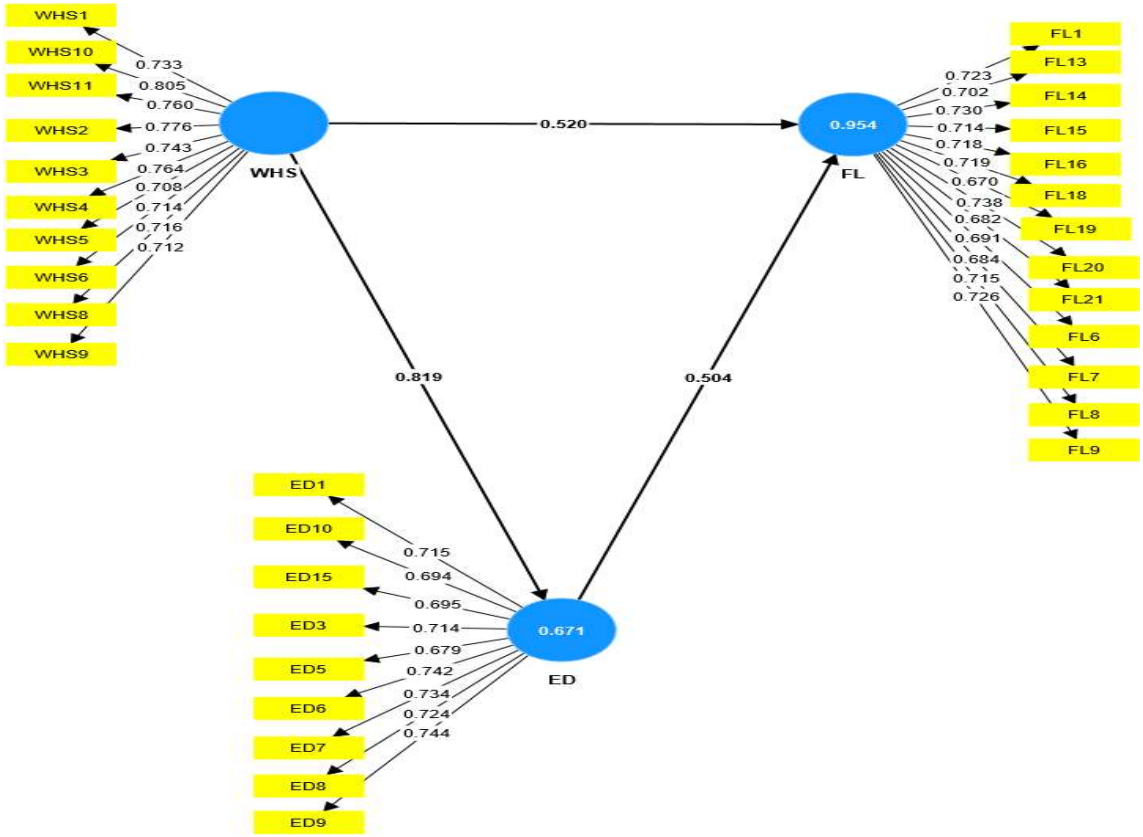


Figure 2: The model built using SEM-PLS. Source: Developed by the authors on the basis of collected data using Smart PLS v.3.

5.1 Reliability and validity

The technique developed by Rossiter (2002) was employed to evaluate the validity and reliability of the constructs. Initially, the convergent and discriminant validity of the scale items were assessed, followed by an evaluation of the reliability of the scale items.

5.2 Convergent validity

The concept of "convergent validity" pertains to the necessity for items that serve as measures of a particular construct to exhibit a substantial degree of shared variance (Hair et al., 2006). The convergent validity of the scale items was assessed using three factors. According to Hair et al. (2007), it is recommended that factor loadings exceed 0.50 and that the composite reliability of each construct should exceed 0.70. Ultimately, it is imperative that the calculated average variance extracted (AVE) for each construct surpasses the suggested threshold of 0.50 Fornell and Larker (1981). The factor loadings obtained from the analysis of indicators impacting social efficiency demonstrated that the three constructs exhibited convergent validity, as the values surpassed the threshold. The factor loadings of variables that influence social efficiency in this research indicate that the three constructs possess convergent validity, as their values surpass benchmark values across all three dimensions. All factor loadings in the first parameter were found to be more than 0.50. The factor loadings exhibited a range between 0.739 and 0.886. The measures appear to possess convergent validity due to the robust factor loadings. The composite dependability for each construct exceeded a threshold of 0.70. The derived average variance extracted (AVE) for each component exceeded the recommended threshold of 0.50. Refer table 4.

Tabl fe 4: Item loadings, reliability and validity.

	Λ	Alpha	CR	AVE	VIF
ED1	0.715	0.881	0.904	0.512	1.832
ED3	0.714				1.825
ED5	0.779				1.545
ED6	0.742				1.917

ED7	0.734				1.837
ED8	0.724				1.708
ED9	0.744				2.283
ED10	0.794				2.026
ED15	0.795				1.605
FL1	0.723	0.918	0.929	0.502	1.856
FL6	0.791				1.856
FL7	0.784				1.843
FL8	0.715				1.845
FL9	0.726				2.374
FL13	0.702				1.899
FL14	0.723				2.204
FL15	0.714				1.978
FL16	0.718				1.916
FL18	0.719				2.226
FL19	0.779				1.978
FL20	0.738				2.091
FL21	0.782				2.123
WHS1	0.733	0.910	0.925	0.553	1.967
WHS2	0.776				2.234
WHS3	0.743				2.084
WHS4	0.764				2.041
WHS5	0.708				1.766
WHS6	0.714				2.038
WHS8	0.716				1.948
WHS9	0.712				1.837
WHS10	0.805				2.684
WHS11	0.764				2.274

5.3 Discriminant validity:

The determination of discriminant validity is a further stage in the process of construct validation. The assessment of discriminant authenticity can be conducted using many methods. Discriminant validity refers to the extent to which a construct is distinct from other constructs. Discriminant validity is demonstrated when the average variance extracted (AVE) inside a construct surpasses the common variance between constructs. According to Henseler et al. (2015), the utilization of the Hetrotrait-Monotrait ratio of correlations (HTMT) is necessary. Researchers may employ specific cut-off values, such as 0.85 and 0.90, to analyze and interpret their Hierarchical-Task Modelling Technique (HTMT) data. The examination of discriminant validity in PLS structural equation modelling is a crucial aspect of model assessment, and the use of the HTMT method represents a contemporary approach in this regard. The veracity of findings supporting hypothesized systemic pathways cannot be definitively established by researchers without a clear definition of discriminant validity, as it is uncertain whether these findings are genuine or merely a result of statistical inconsistencies. Traditional approaches for assessing discriminant validity, such as the Fornell-Larcker criteria and (partial) cross-loadings, are sometimes insufficient in detecting a lack of discriminant validity. In contrast, the HTMT criterion is explicitly more effective in this regard. Table 6 presents the HTMT values of the indicators that influence social efficiency. These values are found to be below the threshold value of .85 as suggested by Kline (2011) and .90 as suggested by Gold and Arvind Malhotra (2001). This indicates that the study exhibits valid discriminant validity. In conclusion, the measures demonstrated both convergent and discriminant validity.

Table 5: Discriminant Validity-Cross Loadings

	ED	FL	WHS
ED1	**0.703**	0.630	0.627
ED3	**0.701**	0.625	0.616
ED5	**0.672**	0.598	0.571
ED6	**0.742**	0.691	0.590
ED7	**0.741**	0.684	0.550
ED8	**0.729**	0.716	0.602
ED9	**0.755**	0.727	0.586
ED10	**0.703**	0.681	0.560
ED15	**0.691**	0.634	0.577
FL1	**0.723**	0.721	0.624
FL6	**0.742**	0.691	0.590
FL7	**0.741**	0.684	0.550
FL8	**0.729**	0.716	0.602
FL9	**0.755**	0.727	0.586
FL13	0.685	**0.702**	0.733
FL14	0.593	**0.729**	0.771
FL15	0.615	**0.714**	0.741
FL16	0.624	**0.718**	0.764
FL18	0.607	**0.718**	0.712
FL19	0.574	**0.669**	0.623
FL20	0.646	**0.737**	0.716
FL21	0.705	**0.683**	0.563
WHS1	0.575	0.702	**0.733**
WHS2	0.598	0.734	**0.776**
WHS3	0.618	0.715	**0.743**
WHS4	0.624	0.718	**0.764**
WHS5	0.549	0.605	**0.708**
WHS6	0.610	0.719	**0.714**
WHS8	0.646	0.739	**0.716**
WHS9	0.591	0.623	**0.712**
WHS10	0.646	0.706	**0.805**
WHS11	0.606	0.655	**0.760**

Table 6: HTMT Discriminant validity

	ED	FL	WHS
ED	0.716		
FL	0.730	0.709	
WHS	0.719	0.733	0.744

5.4 Reliability of Measures

The assessment of construct validity culminates in the evaluation of the reliability of the construct items. Reliability refers to the extent to which an instrument consistently produces similar results over time or the extent to which a set of measurements is internally consistent. The importance of reliability cannot be overstated; yet, it is not enough on its own. Even when measurements exhibit great reliability, they may still lack validity in determining the relevance of a construct (Hair et al., 2006). All valid metrics can measure the same construct. The concept of a composite alpha value pertains to the measurement of internal consistency or composite dependability. The aforementioned characteristic was employed in assessing the reliability of the constructs. Reliability coefficients should be constructed to have a minimum value of 0.70. (Hair et al., 1998; Rossiter, 2002). The composite reliability and Cronbach's Alpha values for the construct were calculated using Smart PLS. These

values varied from 0.904 to 0.929 and 0.881 to 0.918, respectively (see table 4).
Therefore, it can be concluded that all of the variables employed in this construct exhibit high levels of reliability, as evidenced by the Composite Reliability and Cronbach's Alpha coefficients, both of which exceed the threshold of 0.7. This finding suggests a high level of reliability.

5.5 Multicollinearity

Multicollinearity arises when there is a strong correlation between two or more independent variables, suggesting that one or more independent variables can be accurately estimated through a linear combination of other independent variables. In order to mitigate the problem of collinearity, it is generally recommended to adhere to a rule of thumb whereby the Variance Inflation Factor (VIF) should be equal to or less than 5 (Hair et al., 2011). Additionally, as stated in previous scholarly articles, the authors Knock and Lynn (2012) have suggested that VIF values exceeding 3.3 may be symptomatic of collinearity. Table 4 list out multicollinearity (Variance Inflation Factor (VIF)) value of indicators influencing social efficiency of cement industry. Based on the observation, it can be noted that the Variance Inflation Factor (VIF) values for all items are below 3.3, suggesting a low level of collinearity among the items. Therefore, it can be inferred that the items exhibit a low degree of collinearity.

5.6 Outer Loadings

In the context of reflective measurement models, the term "outer loading" pertains to the estimated associations, represented by arrows, between a latent variable and its corresponding indicators. The evaluation pertains to the absolute contribution of an item to the construct with which it is associated. According to Henseler et al. (2015), outer loadings equal to or greater than 0.7 are considered to be quite satisfactory. According to Chin (1998), a threshold of 0.5 is considered appropriate, and any components with values below this threshold should be disregarded. Table 4.4 lists out outer loadings of indicators influencing social efficiency of cement industry. The outer loadings for certain items were below from threshold value and all those items were discarded. Based on the aforementioned data (table 4), it is evident that the outer loading value for all other things exceeds 0.7 or higher. Consequently, each item may be deemed highly satisfactory and will be retained for subsequent examination. This can also be verified by the utilization of bootstrapping by examining the p-value at a significance threshold of 5%. Table 6 list out p value of indicators influencing social efficiency of cement industry. Since, P-Value < 0.05, for all item that are retained, each item is significant and fits the data well.

Table 6 Path Coefficients of Hypothesis

DV	IV	B	Sample Mean (M)	Standard Deviation (SD)	T Statistics	P Values	Adjusted R^2
Social Efficiency	Equity & Diversity	0.504	0.504	0.026	19.357	0.00	0.953
	Fair Labor	0.819	0.821	0.021	38.839	0.00	
	Workers Health & Safety	0.520	0.519	0.026	19.951	0.00	

5.7 Hypothesis testing

The hypothesis was examined by the implementation of a bootstrapping approach, as recommended by Hair et al. (year). This procedure involved generating a resample of 10,000 iterations.
worker's health and safety (β 0.504, t 19.35, p<0.5) is found to have positive significant impact on social efficiency. Fair labor (0.819, t 38.83, P<0.5) is found to have positive significance on social efficiency. Equity & Diversity (0.504, t 19.951, P<0.5) is also found to have significant relationship social efficiency. On the basis of table 6 we confirm the acceptance of all (H1, H2 & H3) hypothesis. A value of adjusted R-squared that is in close proximity to 1 signifies that a substantial percentage of the variability in the dependent variable can be accounted for by the independent variables included in the model. In the given context, when the adjusted R-squared value is 0.95, it signifies that roughly 95% of the variance seen in the dependent variable can be explained by the independent variables incorporated into the model. On the contrary, a lower adjusted R-squared value indicates that the independent variables used in the model have little explanatory power in accounting for the variability observed in the dependent variable. Table 6 clearly shows the 95% adjusted R^2 this implies that the inclusion of the independent variables in the model may explain about 95% of the variability observed in the dependent

variable.

6. Discussion

Upon conducting a literature review, we discovered a collection of publications that pertained to the topic of social sustainability in relation to the cement business. However, we observed a scarcity of literature specifically addressing the concept of social efficiency within the context of the cement industry. In our study we assessed the social efficiency with similar social sustainability indicators in which we took 3 indicators which are workers health & safety, Equity & diversity and fair labor as per GRI framework. The notions of social efficiency and social sustainability are intrinsically linked, pertaining to the welfare and resilience of societies. Although these terms have unique definitions, they are intricately interconnected and can synergistically support one another when effectively controlled.

The correlation between the well-being and safety of workers and social efficiency is a fundamental and intricate one. Social efficiency is a concept that pertains to the most effective distribution of resources and the attainment of the highest possible level of society welfare. The inclusion of workers' health and safety is crucial to the overall effectiveness of society due to various factors. It is widely recognized that workers who are in good health and operate in safe environments tend to exhibit higher levels of productivity. Employees who experience good health and a sense of security inside their work environment are more inclined to exhibit optimal performance. Enhanced productivity has a pivotal role in fostering economic expansion and promoting the well-being of society as a whole. Occupational accidents and diseases incur substantial economic burdens, encompassing expenses related to medical treatment, diminished pay, and reduced productivity. By placing a higher importance on the well-being and safety of workers, it is possible to reduce these expenses, hence allocating resources more efficiently for more productive purposes in the broader societal context. The promotion of employees' well-being serves to enhance social welfare through the mitigation of pain, enhancement of quality of life, and facilitation of social fairness. The provision of secure and conducive work settings to individuals contributes to an elevation in the general societal standard of living.

Upon conducting an analysis of the workers' health data, it was observed that a significant proportion of workers expressed a strong consensus regarding the adverse health effects caused by the cement industry on both workers and the surrounding community. Specifically, they acknowledged that the presence of cement dust has led to a decline in air quality, resulting in various health issues. Furthermore, the soil deterioration caused by cement plants in the district of Pulwama, Kashmir, has negatively impacted cultivation, particularly affecting saffron cultivation in the area. The prioritization of workers' well-being has multiple benefits, both for the individuals themselves and for society at large. These advantages encompass not just economic growth and stability, but also the enhancement of overall quality of life. Hence, it is imperative for governments, businesses, and communities to prioritize the cultivation of secure and conducive working conditions, as these are essential components of social efficiency.

Coming to the second variable which is equity & diversity, the concepts of equity and diversity are frequently associated with the objective of guaranteeing equitable and impartial access to opportunities and resources for all individuals and groups. The presence of increased diversity and equity throughout all domains of society, including education, employment, and public decision-making, has the potential to foster improved representation of diverse perspectives and needs. Consequently, this phenomenon can facilitate the attainment of socially optimal results by mitigating the marginalization of specific demographics and promoting the efficient allocation of resources. The promotion of diversity has the potential to promote social efficiency through the facilitation of innovation and creativity. A workforce or community characterized by diversity has the potential to foster a multitude of perspectives, backgrounds, and proficiencies, hence facilitating the generation of inventive resolutions to intricate challenges. The process of innovation has the potential to stimulate economic growth and enhance societal well-being.

The findings of the survey indicate that a substantial proportion of participants expressed their perception of equitable prospects for professional progression inside the cement plants they are affiliated with. This demonstrates a dedication to ensuring equitable opportunities for professional advancement irrespective of one's background. The workforce was acknowledged by workers for its diversity, as it consisted of people originating from different locations and backgrounds. The cement mills located in the region of Kashmir exhibit a notable degree of workforce diversity. A significant proportion of participants conveyed a sense of inclusivity and respect within their professional environment. This implies the presence of a hospitable and encompassing environment

that places importance on the input of every employee. The participants indicated that they did not encounter any instances of prejudice according to variables such as gender, religion, or ethnicity. This statement highlights the dedication of the cement sector in Kashmir to fostering an inclusive work environment devoid of discrimination. The workers' stated high levels of job satisfaction suggest that they are satisfied with their working conditions and see their efforts to be appreciated.

Fair labor practices encompass a range of measures aimed at promoting equitable compensation, secure working environments, appropriate work schedules, and safeguarding the rights of workers. These practices have the potential to enhance societal efficiency through several means. There is a positive correlation between equitable treatment of workers and their satisfaction with working circumstances, leading to increased motivation and productivity. The enhanced level of productivity has the potential to result in elevated economic output and improved efficiency within the production process. The implementation of equitable labor practices has the potential to mitigate employee turnover, since individuals are more inclined to remain in their positions when they get just compensation and are treated with dignity. The presence of high turnover within an organization can result in significant financial burdens and disruptions to production operations. Conversely, a reduction in turnover rates can positively impact operational efficiency. The implementation of equitable labor practices frequently encompasses the provision of opportunity for workers to enhance their skills and get training. This phenomenon has the potential to result in a workforce that possesses enhanced skills and adaptability, thereby playing a crucial role in maintaining efficiency within an economy characterized by frequent changes. The incorporation of fair labor practices often involves the facilitation of opportunities for workers to improve their skills and get training. This phenomenon has the potential to yield a workforce that exhibits heightened abilities and adaptability, therefore playing a pivotal role in sustaining efficiency within an economy marked by frequent fluctuations. In certain instances, the operation of market forces in isolation may not result in equitable labor practices. Government restrictions and interventions may be deemed required in order to address market failures and externalities. In the absence of labor rules and regulations, certain companies may engage in the exploitation of workers through the provision of inadequate salaries or hazardous working environments, hence resulting in adverse societal ramifications. Government interventions have a crucial role in fostering the alignment of fair labor practices with the objectives of social efficiency.

A detailed survey was undertaken among workers employed at numerous cement facilities, with the aim of gathering data pertaining to various dimensions of their job satisfaction. The primary domains of investigation encompassed remuneration, working environment circumstances, equitable managerial practices, and the general level of contentment derived from one's occupation. In conjunction with conventional survey data, we employed facial expression analysis technologies to assess the emotional reactions of workers during interviews. By employing this methodology, we were able to detect nuanced indications of discontent, even in cases when participants did not overtly articulate their grievances. The findings of the study revealed that a substantial proportion of employees expressed contentment with their remuneration. The pleasure of these individuals was mostly attributed to the industry-standard salary packages provided by their particular cement factories. Remarkably, the examination of facial expressions conducted in our study unveiled that a subset of employees exhibited indications of discontentment during the interview process, while recognizing that they were treated fairly by their respective employers. The individuals in question exhibited nonverbal signs, such as the contraction of the forehead muscles, downward turning of the corners of the mouth, or avoidance of direct visual engagement, while engaging in conversations pertaining to remuneration. These findings underscore the importance of effective communication between management and workers. Regular communication between employers and employees is essential, even if employers believe they are providing competitive compensation packages, in order to effectively address any latent concerns or misunderstandings.

6.1 Practical implication

Examining the correlation between social efficiency and the well-being of workers, as well as the principles of fairness and diversity, and the implementation of fair labor practices, can provide several pragmatic ramifications for enterprises, legislators, and the broader societal context. The comprehension of the relationship between social efficiency and the health of workers might facilitate the adoption of policies and practices that emphasize the well-being of employees. This may encompass the provision of enhanced healthcare benefits, the promotion of a more favorable equilibrium between work and personal life, and the establishment of a more secure occupational milieu. Research on the correlation between social efficiency and equity and diversity can shed light on the significance

of cultivating a workforce that is inclusive and diverse. Organizations may be motivated to adopt diversity and inclusion efforts, mitigate discriminatory practices, and establish equitable opportunities for their entire workforce.

This study has the potential to provide insights into the correlation between societal efficiency and fair labor practices, encompassing aspects such as equitable remuneration, appropriate working hours, and employment stability. Organizations may have a propensity to embrace ethical labor norms and uphold equitable treatment of their workforce.

Business enterprises may ascertain that allocating resources towards the enhancement of employee well-being, fostering diversity, and upholding equitable labor standards can indeed augment overall productivity and efficiency. This phenomenon can lead to financial savings, enhanced work quality, and heightened profitability. By placing a high value on the well-being of workers, promoting equality and diversity, and implementing just labor practices, organizations have the potential to enhance employee happiness and bolster rates of employee retention. Employees that experience high levels of job satisfaction and actively participate in their work are more inclined to remain with their employers, hence diminishing the expenses associated with employee turnover. Gaining insight into the correlation between social efficiency and equitable work practices can assist organizations in maintaining adherence to labor laws and regulations. Implementing this strategy can help to reduce legal liabilities and minimize the financial penalties that may arise from non-compliance. Companies that demonstrate exceptional performance in these specific domains have the potential to acquire a competitive advantage inside the market. There is a growing recognition among consumers and investors regarding the importance of businesses exhibiting social responsibility. This trend has the potential to significantly enhance a company's brand reputation and financial outcomes. In summary, an investigation of the correlation between social efficiency and many factors such as workers' health, equity and diversity, and fair labor practices holds significant potential for generating wide-ranging consequences for enterprises, governments, and society as a whole. This statement underscores the need of establishing a professional setting that fosters employee well-being and equitable treatment, ultimately yielding advantages for both individuals and companies.

6.2 Limitations and future Research

The present investigation was subject to many constraints. Initially, the study exclusively concentrated on the cement sector in the region of Kashmir. In order to gain a more comprehensive understanding of the effects of the cement industry on workers' health, job satisfaction, and equity and diversity, it is recommended that future research extend their analysis to include additional emerging and economically developed countries, as well as countries that have placed more emphasis on the cement sector. Furthermore, the study employed a methodology that involved evaluating hypotheses using cross-sectional survey data. Subsequent research endeavors may prioritize the utilization of longitudinal data to effectively determine the dynamic fluctuations within the cement business. Furthermore, the current study did not examine the influence of any moderating variables. Potential future research endeavors may involve the examination of the moderating influence exerted by market orientation, government policy, or culture.

7. Conclusion

In summary, this research investigation has explored the complex dynamics of the cement industry in the region of Kashmir, with a particular focus on analyzing the correlation between social efficiency and a number of key independent variables, namely the well-being of workers, equitable practices, diversity, and fair labor standards. By employing a well-constructed technique and doing thorough analysis, significant insights have been revealed that provide insight into the complex nature of these interactions. Our investigation has identified a robust and favorable correlation between social efficiency and the well-being of workers in the cement sector in Kashmir. This discovery highlights the significance of placing emphasis on the welfare of employees as a strategy to improve overall societal effectiveness within this industry. Enhanced health outcomes not only yield advantages for individual workers but also make a substantial contribution towards fostering a more productive and sustainable industry.

Additionally, our study has brought attention to the significant influence of fairness and diversity on social efficiency. The research unequivocally illustrates that cultivating a work environment that is both inclusive and equitable has a favorable correlation with heightened social efficiency within the cement business. The act of embracing diversity and supporting equal opportunities is not only in accordance with ethical values, but it also has discernible advantages in terms of productivity and general social performance. Our work has shown the

crucial significance of equitable labor practices in influencing societal productivity. The identified correlation between fair work practices and social efficiency underscores the significance of maintaining ethical and equitable employment standards within the sector. The implementation of equitable remuneration, secure occupational environments, and the protection of workers' rights not only enhances the well-being of laborers but also fosters a more socially conscientious and productive cement sector. This research study has effectively established compelling evidence for the presence of a substantial and favorable correlation between social efficiency and the primary independent variables encompassing workers' health, equity, diversity, and fair labor practices within the cement sector of Kashmir.

The aforementioned findings offer significant insights for various stakeholders in the industry, policymakers, and practitioners. These insights emphasize the need of prioritizing these elements in order to promote a cement sector that is both socially responsible and economically efficient. In light of the ongoing evolution of the industry, it is imperative to take into account these interconnections when making decisions and implementing programs that seek to enhance the welfare of workers and the overall societal effectiveness of the industry in Kashmir and other regions.

References:

Akula, S. C., Singh, P., Farhan, M., Kumar, P., Cheema, G. S., Rehman, M., Sharma, A., & Kumar, P. (2024). Evaluating the Effectiveness of a Chatbot-Based Workshop for Experiential Learning and Proposing Applications. Eurasian Journal of Educational Research, 2024(109), 32–45. https://doi.org/10.14689/ejer.2024.109.003

Ashraf M, Bhat GA (2013). Impact of Cement Dust on Soil and Vegetation around Khrew Cement Factories. M. Phil. Dissertation, University of Kashmir, Srinagar-190006, pp: 15.

Bhat, M. A., Gaga, E. O., & Özkan, A. (2022). A New Approach Within AHP Framework for Prioritization of Air Quality Management in Kashmir. In *Biodiversity, Conservation and Sustainability in Asia: Volume 2: Prospects and Challenges in South and Middle Asia* (pp. 981-995). Cham: Springer International Publishing.

Böhm, M., & Pierkes, R. (2009). Evaluation of Portland cement clinker with optical microscopy-Case Studies. *Proceedings of the 12th Euroseminar on Microscopy Applied to Building Materials, Dortmund, GermanySeptember*, 15-19.

Bibi, U.; Balli, H.O.; Matthews, C.D.; Tripe, D.W.L. Impact of gender and governance on micro finance efficiency. J. Int. Finance. Mark. Inst. Money **2018**, 53, 307–319

Coelli, T. J., Rao, D. S. P., O'Donnell, C. J., & Battese, G. E. (2005). *An introduction to efficiency and productivity analysis*. springer science & business media.

Callejón, M., & Segarra, A. (1999). Business dynamics and efficiency in industries and regions: The case of Spain. *Small Business Economics*, *13*, 253-271.

Chang, H.F. A Liberal Theory of SocialWelfare: Fairness, Utility, and the Pareto Principle. Yale Law J. **2000**, 110, 173–235

Chortareas, G.E.; Girardone, C.; Ventouri, A. Financial freedom and bank efficiency: Evidence from the European Union. J. Bank. Financ. **2013**, 37, 1223–1231.

C. Muller, S. Palm, Cement grades with a low Portland cement clinker ratio for the concretes of the future, in: Bundesver band Deutsche Beton- und Fertigteil industries (Ed.), Sustainable Innovation: Proceedings 55th BetonTage, Neu-Ulm 10–11 February 2011. 86–89, 2011.

Daniels, M. R. (1969). Differences in efficiency among industries in developing countries. *The American Economic Review*, *59*(1), 159-171.

Deja, J., Uliasz-Bochenczyk, A., & Mokrzycki, E. (2010). CO2 emissions from Polish cement industry. *International Journal of Greenhouse Gas Control*, *4*(4), 583-588.

Dar, M. N., Manzoor, M. F., Kaushik, V., Kumar, M., Rawat, S., Shah, K. M., ...& Singh, E. A. (2017). Water Quality assessments of Dal Lake, Jammu & Kashmir. *International journal of scientific & engineering research*, *8*, 12.

Dar AR, Dar GH (2006) The wealth of Kashmir Himalaya-Gymnosperms. Asian J Plant Sci 52:251–259

Elkington, J. Towards the sustainable corporation: Win-win-win business strategies for sustainable development. Calif. Manag. Rev. Berkeley **1994**, 36, 90.

Fayaz, S., Rather, G. M., Naqshbandi, Z. K., & Bhat, M. S. (2017). INDOOR AIR QUALITY AND ITS IMPACT ON HEALTH OF GUJJARS OF NORTH KASHMIR HIMALAYAS. *JOURNAL OF INDIAN RESEARCH*, *5*(2), 50-61.

Frankental, P., 2001. Corporate social responsibility e a PR invention? Corporate Communications: An International Journal 6 (1), 18e23.

Gutierrez-Goiria, J.; San-Jose, L.; Retolaza, J.L. Social Efficiency in Microfinance Institutions: Identifying How to Improve It. J. Int. Dev. **2017**, 29, 259–280.

Galema, R.; Koetter, M. European Bank Efficiency and Performance: The Effects of Supranational Versus National Bank Supervision. In The Palgrave Handbook of European Banking; Palgrave Macmillan: London, UK, 2016; pp. 257–292. ISBN 978-1-137-52143-9.

Global reporting Initiatives. (2002). Retrieved December 11, 2014 from https://www.globalreporting.org/reporting/G3andg3-1/guidelines online/TechnicalProtocol/Pages/ MaterialityInTheContextOfTheGRIReportingFramework.aspx.

Global Reporting Initiative. (2015). Retrieved on 15 December 2016 from\https://www.globalreporting.org/resourcelibrary/GRIG4-Part1-Reporting-Principles-and Standard-Disclosures.pdf.

Gutierrez-Goiria, J., San-Jose, L., & Retolaza, J. L. (2017). Social efficiency in microfinance institutions: Identifying how to improve it. *Journal of International Development*, *29*(2), 259-280.

Ighalo, J. O., & Adeniyi, A. G. (2020).A perspective on environmental sustainability in the cement industry. *Waste Disposal & Sustainable Energy*, *2*(3), 161-164.

J. Harder, Development of clinker substitutes in the cement industry, Zement- Kalk-Gips 59 (2) (2006) 58–64. [17] B. Hauer, H. Klein, Recycling of concrete.

Jehangir, A., Dar, N. A., Yousuf, A. R., &Sofi, A. H. (2011). Air quality at Sonamarg-a tourist hill station in Kashmir valley, India. *Journal of Experimental Sciences*, *2*(6).

Kajaste, R., & Hurme, M. (2016). Cement industry greenhouse gas emissions–management options and abatement cost. *Journal of cleaner production*, *112*, 4041-4052.

Kang, D., & Lee, D. H. (2016). Energy and environment efficiency of industry and its productivity effect. *Journal of Cleaner Production*, *135*, 184-193.

K. Bauer, V. Hoenig, Energy efficiency of cement plants, Cement International 8 (3) (2010) 148–152.

Lefeber, L., & Vietorisz, T. (2007). The meaning of social efficiency. *Review of Political Economy*, *19*(2), 139-164. https://doi.org/10.1080/09538250701256672

Lebovics, M.; Hermes, N.; Hudon, M. Are Financial and Social Efficiency Mutually Exclusive? A Case Study of Vietnamese Microfinance Institutions. Ann. Public Coop. Econ. **2016**, 87, 55–77

Mehraj, S. S., Bhat, G. A., Balkhi, H. M., &Gul, T. (2013). Health risks for population living in the neighborhood of a cement factory. *African Journal of Environmental Science and Technology*, *7*(12), 1044-1052.

Nagpal, R., Singh, P., Angra, P. K., Cheema, G. S., & Rehman, M. (2024). Wearable Computing: Canonical Correlation Analysis (CFA) Statistical Method to Validate the Measurement Models Smart Ergonomic Shoes. International Journal of Intelligent Systems and Applications in Engineering, 12(17s), 404–408.

Rehman, M., Dhiman, B., Kumar, R., & Cheema, G. S. (2023). Exploring the Impact of Personality Traits on Investment Decisions of Immigrated Global Investors with Focus on Moderating Risk Appetite : A SEM Approach. 8984(August), 95–110.

Nelson, J., 2004. The Public Role of Private Enterprise: Risks, Opportunities and New Models of Engagement. CSR Initiative. Working Paper 1. John F Kennedy School of Government, Harvard University, Cambridge, MA.

Rehman, M., & Dhiman, D. B. (2022). To Study the Impact on the Perception of Banking Customers toward E-Banking (A Case Study of Jk Bank Customers). Journal of Corporate Finance Management and Banking System, 26, 10–20. https://doi.org/10.55529/jcfmbs.26.10.20

Rehman, M., Dhiman, D. B., & Cheema, G. S. (2024). Minds and Machines: Impact of Emotional Intelligence on Investment Decisions with Mediating the Role of Artificial Intelligence. International Journal of Engineering, Business and Management, 8(1), 01–10.

S. Puntke, M. Schneider, Effects of phosphate on clinker mineralogy and cement properties, Cement International 6 (5) (2008) 80–93

San-Jose, L.; Retolaza, J.L.; Torres Pruñonosa, J. Efficiency in Spanish banking: A multi stakeholder approach

analysis. J. Int. Finance. Mark. Inst. Money **2014**, 32, 240–255.
Ter Bogt, H.J. (2021). Efficiency, Types of. In: Marciano, A., Ramello, G.B. (eds) Encyclopedia of Law and Economics. Springer, New York, NY. https://doi.org/10.1007/978-1-4614-7883-6_43-2
Wildavsky, A. (1966). The political economy of efficiency: cost-benefit analysis, systems analysis, and program budgeting. *Public Administration Review*, 292-310.