# Building Socially Sustainable Practices in Cement Industry: Measurement and Validation

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**KEYWORDS**

Social sustainability, Cement industry, Kashmir, Workers' health & safety, Equity & diversity, Fair labor, Scale validation.

**ABSTRACT**

**Purpose:** This study aims to address the growing interest in social sustainability within the cement industry, particularly in developing countries, by introducing the concept of Cement Industry Social Sustainability (CISS). The research develops and validates a comprehensive measurement scale for CISS, focusing on the specific social dimensions of the cement industry.

**Design/Methodology/Approach:** Using a mixed-methods approach, the study integrates insights from in-depth interviews and survey data collected from the cement sector in Kashmir. Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were conducted using AMOS software to ensure the reliability and validity of the CISS scale.

**Findings**: The study identifies three key dimensions of CISS: (1) Workers' Health & Safety, (2) Equity & Diversity, and (3) Fair Labor. A 38-item scale was validated, providing a robust tool to measure social sustainability practices in the cement industry.

**Practical Implications:** The findings offer actionable insights for policymakers and industry leaders to design targeted interventions promoting social sustainability. By adopting the validated CISS scale, organizations can systematically evaluate and improve their social practices.

**Originality/Value:** This research fills a significant gap in the literature by conceptualizing and operationalizing social sustainability in the cement industry, a relatively underexplored area. The validated CISS scale provides a novel framework for future research and practical application in the context of developing countries.

**Article Classification:** Research paper

## 1.Introduction

In their Brundtland report "Our Common Future," published in 1987, the World Commission on Environment and Development defined sustainable development as the kind of progress that takes care of current needs while preserving the capacity of future generations to meet their own. It aims to strike a balance between social and environmental balance preservation and economic growth. The Rio Earth Summit in 1992 also emphasised the integration of three elements: social justice, economic progress, and the environment's carrying capacity, or the natural systems in which we live (Dyllick and Hockerts 2002; Kovacs 2008). Sustainability should inevitably take biophysical and socioeconomic factors into account. In order to achieve economic fairness, it is necessary to address the interdependence of socioeconomic and biophysical issues as well as their interactions within a wider complex system that includes humans and ecological repercussions (Gibson 2006).

It is essential to comprehend the three separate dimensions economic, environmental, and social as well as how they interact. Nonetheless, there hasn't been much focus on the social dimension in the literature (Fahimeh et, al 2023; Jian et, al 2014; Mani et, al 2016). whereas the bulk of research focuses on wealthy nations (Carter and Jennings, 2002, 2004; Gunasekaran and Spallanzani, 2012; Pinar et al., 2014). Aside from a small number of research, in underdeveloped nations and emerging economies (Chaves et, al 2021; Sangwan et, al 2019) research on cement industry social sustainability (CISS) is scarce. Social sustainability, which highlights the critical significance of inclusivity, ethical behaviour, and community well-being, is a key component of long-term success in the cement industry (Rodrigues,2011). The industry can establish positive relationships with its surroundings by prioritising health and safety standards, actively engaging with local communities, and offering employment opportunities (Rasmi & Turkay, 2023). Sustainable and peaceful coexistence is facilitated by stakeholder collaboration, environmental justice principles, and moral business conduct. In the cement industry, social sustainability is not only a corporate responsibility but also a strategic imperative that builds credibility, trust, and long-term resilience (Nidheesh & Kumar 2019).

This study (I) recognises social problems related to the cement industry and (ii) practises a questionnaire survey from employees of cement plants in Kashmir. To create and authenticate structures for gauging CISS in order to report the dearth of CISS works on developing countries. Our contributions are as follows: (I) defining the social problems associated with the cement industry in Kashmir; (ii) proposing a fresh interpretation of social sustainability as CISS with an emphasis on the cement plants in Kashmir; and (iii) creating and evaluating SCSS scales.

We present a review of the CISS literature in the section that follows. Our methodology is presented in the third section, while the outcomes of the qualitative and quantitative measures that were used to create and authorise the scales are examined in the fourth section. Next, we go over the research results in relation to the CISS literature and the managerial inferences of our work. The final segment offers a summary of our results, identifies the constraints, and makes recommendations for further research.

## 2.Conceptual background:

### 2.1 Cement Industry social sustainability and dimensions

A hotly debated and important topic in today's world of growing environmental degradation (global warming, ozone layer depletion, etc.) and human rights violations is sustainability, or sustainable development (Gladwin et, al 1995). Sustainability, sometimes referred to as the triple bottom line (TBL) or 3BL, has three dimensions: economic, social, and environmental. We are concerned in the social aspect of sustainability in this paper. According to scholars, social sustainability is an ethical system of values that direct human survival and advancement

and emphasise the necessity of responsible and inclusive behaviour (Lafferty and Langhelle, 1999; Sharma and Ruud, 2003).

Socially responsible manufacturing practices are those that consider both the product and process elements that impact people's health, safety, and well-being (Wood, 1991). Between 1987 and 1999, a number of researchers created terms such as clean manufacturing, green manufacturing, sustainable manufacturing, etc (Sangwan & Mittal 2015). Over a hundred definitions of sustainability have emerged in the years that have followed. Sustainability has been referred to as corporate, industrial, and business sustainability (Lee & Lee 2014). Although the specifics of these definitions may vary, they all concur that sustainability seeks to achieve social, economic, and environmental objectives (Labuschagne et al., 2005; MSA, 2008).

Since cement is a necessary ingredient in concrete, there is a constant global demand for its production. Cement manufacturing is forced to produce goods on a large scale in order to meet this rising demand, which classifies it as a heavy industry. According to WBCSD (2009), the International Energy Agency's (IEA) 2050 forecast for cement production was reportedly exceeded, with a world-wide construction of 4.2 billion in 2016 (An et, al 2019).

There is a clear void in the literature on industrial sector sustainability when it comes to the social aspects of the cement industry. Although there is an increasing amount of research exploring the idea of social sustainability in supply chains more broadly, the amount of research specifically focusing on the cement industry seems remarkably small (Domingues et al.,2015; Carter and Jennings, 2002, Kozlowski et al., 2015; 2004; Corbière-Nicollier et al., 2011.). A thorough analysis of the body of research indicates that there are few studies that systematically look into and evaluate the social sustainability matters particular to the cement manufacturing industry (Sonebi et al, 2016; Kuldeep & Vikrant, 2018).

Even though social factors are becoming more and more important in sustainable development, there is tranquil a absence of research on the social aspects of the cement industry, which highlights a gap in the field that needs to be filled. This gap highlights the potential for future research endeavours to meaningfully contribute to the broader discourse on sustainable industrial practices, as well as the need for a more nuanced understanding of the socio-economic impacts associated with cement production.

We employed both qualitative and quantitative techniques to determine, create, and validate CISS measures. First, we looked over the research on operations management, sustainable development, social sustainability, and sustainability (Rowley and Slack, 2004; Chen et al., 2014;). Since these databases offer thorough coverage of highly regarded journals, we searched through Inderscience, Elsevier, and Taylor and Francis Emerald Insight. "Social sustainability and the cement industry," "Social sustainability and evaluation," "Social sustainability and the growing economy," and "Social sustainability and Kashmir" were our key phrases.

We then assembled a panel of experts to get their advice and improve our scales. First and foremost, members need to be informed about the sustainability and workings of the Indian cement industry. To guarantee that their perspectives are varied, the members would also come from a variety of backgrounds. There were ten experts in total; seven of them were managers of the cement business from various states, and the other seven were researchers from various universities. The expert panel covered topics such as fair labour practices, worker's safety, equity, diversity, inclusion, child labour, bonded labour, safety, and health. Furthermore, the CISS dimensions of housing, education, and poverty were eliminated, despite the fact that the academic and professional literature has recognised them as unrelated to the cement industries. The pertinent dimensions of fair labour, workers' health and safety, and equity were determined. The final social sustainability scale includes 50 statements out of 59.

## 3. Methodology:

3.1 Sample survey:

We obtained information from Jammu and Kashmir's Department of Industry and Commerce to create an exhaustive list of all the cement plants that are currently in operation (Rasmi & Turkay, 2023). Nine operational cement plants were included in the provided list, all of which were chosen to be included in our investigation. Afterward, we obtained information from the Department of Economics and Statistics about the labour force that was employed in these nine plants. Based on the information that was obtained, there were 938 workers working in total across all of the cement plants.

We used the Krejcie and Morgan formula to guarantee a representative sample for our investigation (Zayed et, al, 2022), and the sample size that we computed was 272. By using this strict methodology (Ataei et, al ,2022), we were able to produce a robust and statistically sound dataset that improved the validity and dependability of our research findings.

Table 1: Demographic Profile of Plants

| Name of cement plant | Frequency | Percentage |
|---|---|---|
| Khyber Cement | 15 | 5.5 |
| Khyber LMT | 35 | 12.9 |
| Arco Cement | 34 | 12.5 |
| TCI | 33 | 12.1 |
| TCI MAX | 36 | 13.2 |
| Saifco Cement | 28 | 10.3 |
| Cemtac Cement | 27 | 9.9 |
| Valley Cement | 34 | 12.5 |
| HK Cement | 30 | 11.0 |

3.2 Data collection

The researcher visited each of the nine cement plants that were part of the study in person and diligently collected data. A complete dataset containing information from all 272 labourers was obtained; the sample size was calculated using the Krejcie and Morgan formula, which took into account the 938 total population. The plant manager provided the researcher with a list of labourers, which they selected systematically through random sampling (wright et, al, 2015). Through the use of the systematic random sampling formula, 3.4 was found to be the computed nth term. Rounding up, the ultimate result was found to be 4, indicating that information was methodically gathered from each of the list's four employees, beginning at random in accordance with the guidelines for systematic random sampling (Brus, 2022).

The chosen employees were given a structured questionnaire during the data collection process (Mani et, al, 2022), and their answers were noted. Notably, the researcher marked the responses of employees who were illiterate. All 272 labourers were covered by this painstaking and exhaustive data collection process, which took about 4 to 5 months to complete, guaranteeing a comprehensive and trustworthy dataset for the study.

**3.3 Ethical statement:**

To protect the integrity and welfare of everyone involved, we give ethical considerations top priority throughout the entire data collection process. Before initiating any data collection activities, we obtained explicit permission from the CEO of the organisation as well as the head of the school, with a focus on voluntary participation and openness. The goal, nature, possible risks, and rewards of participation were all explained to participants in detail. They were also reassured that participation was completely voluntary and that they could withdraw at any time without facing any repercussions. Confidentiality and anonymity were strictly upheld throughout the procedure, and precautions were taken to protect participant identities and guarantee data security. We showed our dedication to beneficence and respect for the rights and dignity of participants by closely adhering to all applicable ethical guidelines and regulations.

## 4. Data Analysis and Results:

We performed confirmatory factor analysis (CFA) after exploratory factor analysis (EFA) to verify the validity and reliability of our constructs (Parhyar et, al, 2022).

4.1: Exploratory factor Analysis

To evaluate the Social Sustainability scale's dimensionality and make sure that every measure included only corresponds with the Social Sustainability dimensions, we ran EFA on 272 samples that were gathered during the first phase (Gorsuch, 1988). Two frequently used decision criteria were applied in order to determine the aspects underlying the Social Sustainability dimension. Initially, items loading with a value of less than 0.5 are not included. Secondly, the items that have more than one cross-loading been not included. According to Henseler et al. (2015), outer loadings alike or bigger than 0.7 are considered to be quite acceptable. According to Chin (1998), a threshold of 0.5 is considered appropriate, and any components with values below this threshold should be disregarded. Table 2 list out the outer loadings of factors underlying the social sustainability dimension. 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 Additionally, the table indicates that there were no multiple cross loadings for any item, suggesting the scale's preliminary discriminant validity. Lastly, the reliability values of all the factors (Cronbach's alpha) are bigger than 0.70, demonstrating acceptable level of reliability.

**Table 2:** Outcomes from exploratory factor analysis for social sustainability items.

| | | ED | FL | WHS |
|---|---|---|---|---|
| **Equity & Diversity** | ED1 | **0.703** | 0.230 | -0.027 |
| | ED3 | **0.701** | -0.025 | 0.316 |
| | ED5 | **0.672** | -0.098 | -0.071 |
| | ED6 | **0.742** | 0.291 | 0.190 |
| | ED7 | **0.741** | 0.184 | 0.250 |
| | ED8 | **0.729** | -0.016 | -0.002 |
| | ED9 | **0.755** | -0.027 | 0.186 |
| | ED10 | **0.703** | -0.381 | 0.460 |
| | ED15 | **0.691** | 0.234 | -0.077 |
| **Fair Labor** | FL1 | -0.723 | **0.723** | -0.062 |
| | FL6 | -0.74 | **0.742** | 0.290 |
| | FL7 | -0.741 | **0.741** | 0.350 |
| | FL8 | 0.321 | **0.685** | -0.002 |
| | FL9 | 0.287 | **0.693** | -0.086 |
| | FL13 | 0.005 | **0.702** | -0.033 |
| | FL14 | -0.059 | **0.729** | -0.071 |
| | FL15 | -0.061 | **0.714** | -0.041 |
| | FL16 | 0.324 | **0.718** | 0.264 |
| | FL18 | -0.040 | **0.718** | -0.012 |
| | FL19 | 0.274 | **0.669** | -0.023 |
| | FL20 | -0.064 | **0.737** | -0.016 |
| | FL21 | -0.052 | **0.683** | -0.063 |
| **Worker's health & safety** | WHS1 | -0.057 | -0.073 | **0.733** |
| | WHS2 | 0.598 | -0.034 | **0.776** |
| | WHS3 | -0.061 | 0.215 | **0.743** |
| | WHS4 | 0.014 | -0.018 | **0.764** |

| | | | | |
|---|---|---|---|---|
| | WHS5 | 0.041 | -0.060 | **0.708** |
| | WHS6 | -0.061 | -0.019 | **0.714** |
| | WHS8 | -0.064 | -0.039 | **0.716** |
| | WHS9 | -0.059 | -0.062 | **0.712** |
| | WHS10 | -0.062 | -0.062 | **0.805** |
| | WHS11 | -0.066 | 0.065 | **0.760** |
| **Cronbach's Alpha** | | 0.881 | 0.918 | 0.910 |
| **Eigen Value (Sum of Squares)** | | 4.27 | 3.37 | 1.42 |
| **Average variance extracted (AVE)** | | 0.512 | 0.502 | 0.553 |

4.2 Confirmatory Factor Analysis:

CFA was used to evaluate the scales' uni dimensionality. To evaluate the three SS dimensions, we built a total of two measurement models. In measurement model-1, all social dimensions pertinent to the Social Sustainability dimension were treated as first-order latent variables. First order latent variables like ED, WHS, and FL were used to measure the Social Sustainability dimension, which was regarded as a second order latent construct in the measurement model-2 (Jennings and Carter, 2000). Figure 2 lists the outcomes of each measurement model in terms of the Bentler-Bonett normed fit index (NFI), non-normed fit index, comparative fit index (CFI), adjusted goodness of fit index (AGFI), and goodness of fit index (GFI). According to the results, all of the models show fit indices with a score of 0.90 or higher, which suggests that the two models have acceptable fit indices and that every item is reliable to evaluate the corresponding constructs (Hair et, al, 2010). To improve fit, we kept the measurement items with lower squared multiple correlation values and eliminated the few with the highest standardised residuals values. We also examine the significant justifications for eliminating any measurement items. As a result, our measurement model no longer included the items FL12, FL8, ED5, and ED2, as their item loadings were less than 0.50. We used CR and Cronbach's alpha to test our scales (Fornell and Larcker, 1981). We looked at factor loadings, average variance extracted (AVE), and composite reliability (CR), which shows the standardised path loadings of all the items that are highly closely connected to the equivalent factors, in order to demonstrate convergent validity. High convergent validity is indicated by the fact that all of the model's constructs (Table 2) are greater than the AVE and CR threshold levels (Hair et, al, 2010) (more than 0.5 and 0.7, respectively). Make sure the square root of AVE, the average shared variance (AVE), and the maximum shared variance (MSV) are all greater than the inter-construct correlations for the results to be considered valid. in order to demonstrate discriminant validity. The three factor correlations were all less than 0.80, indicating that the scale has discriminant validity. It was discovered that the MSV was smaller than the factors' average shared variance. The average extracted variance (AVE < ASV) is greater than the average shared variance (ASV) standards. Additionally, the values imply that the square root of AVE is larger than the correlations between the constructs. As a result, the discriminant validity test was passed by all six dimensions.

Table 3: Convergent and discriminant validity of the constructs.

| **Construct** | **CR** | **AVE** | **MSV** | **ASV** | **WHS** | **ED** | **FL** |
|---|---|---|---|---|---|---|---|
| Worker's health & safety | 0.925 | 0.553 | 0.134 | 0.056 | 0.773 | | |
| Equity & Diversity | 0.904 | 0.512 | 0.245 | 0.145 | 0.243 | 0.729 | |
| Fair Labor | 0.929 | 0.502 | 0.367 | 0.137 | 0.465 | 0.442 | 0.765 |

4.3: First order confirmatory factor Analysis.

The first order correlated model for SS was created built on the investigation performed with Amos 20 (Kryazos et, al, 2022) (Figure 1) According to the first-order model, social sustainability is predicted by three independent dimensions, or constructs: ED, WHS, and FL. There are twelve items measuring the ED construct, ten measuring the WHS construct, and fourteen measuring the FL construct (Fig. 1). All necessary tests were successfully completed by the first-order model used to assess social sustainability in the cement industry. Chi-Squared Test: $\chi 2/df$ (CMIN) = 1.481, Goodness of fit index (GFI) = 0.92, non-normed fit index (NFI) = 0.823, Confirmatory fit Index (CFI) = 0.921, and Root Mean Square Error Approximation (RMSEA) = 0.053 (Table 3). As a result, the first order model accurately represents CISS (Seyma et, al, 2022). Additionally, our findings imply that the factor loadings for the first-order ED, WHS, and FL constructs varied from 0.70 to 0.60 to 0.90. Furthermore, there is a.526 correlation between worker health and fair labour, .377 correlation between worker health and equity diversity, and .199 correlation between fair labour and equity diversity.

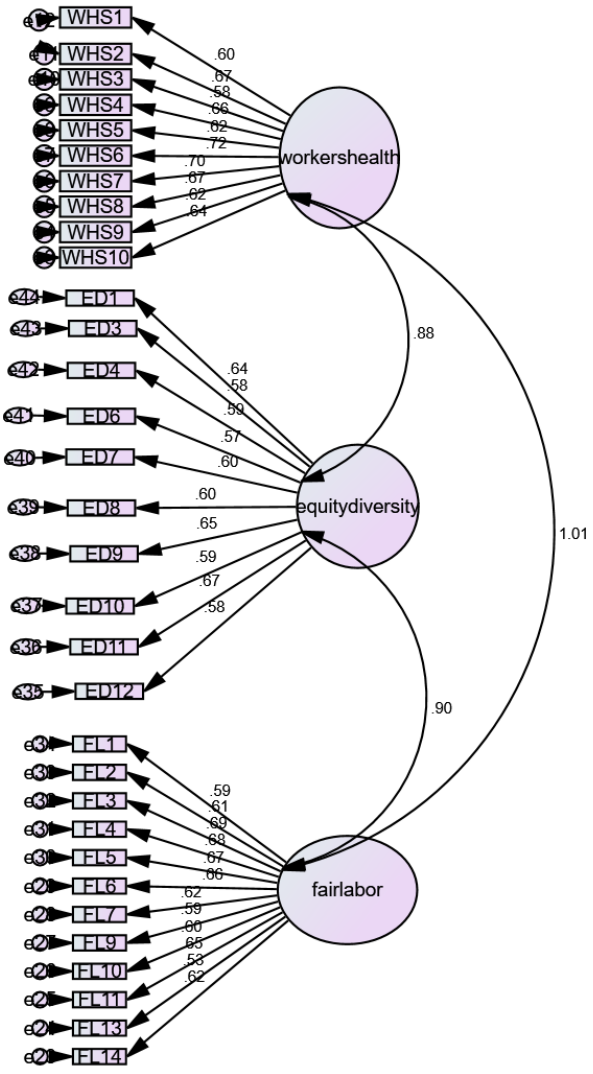


Figure1: First Order confirmatory factor analysis (Measurement Model)

Table 4: First order CFA model tests:

| Chi Squared test: $\chi 2/df$ (CMIN) | Goodness of fit index (GFI) | Non-normed fit index (NFI) | Confirmatory fit Index (CFI) | Root Mean Square Error Approximation (RMSEA). |
|---|---|---|---|---|
| 1.481 | 0.92 | 0.823 | 0.921 | 0.053 |

Table 5: CFA Results for the constructs

| **Component** | **Measurement item** | **Item loading** | **t statistic** | **CR** | **Cronbach's Alpha** |
|---|---|---|---|---|---|
| Worker's health & Safety | WHS1 | 0.599 | 19.951 | 0.925 | 0.910 |
| | WHS2 | 0.674 | | | |
| | WHS3 | 0.578 | | | |
| | WHS4 | 0.658 | | | |
| | WHS5 | 0.618 | | | |
| | WHS6 | 0.715 | | | |
| | WHS7 | 0.699 | | | |
| | WHS8 | 0.667 | | | |
| | WHS9 | 0.623 | | | |
| | WHS10 | 0.641 | | | |
| Equity & Diversity | ED1 | 0.637 | 19.357 | 0.904 | 0.881 |
| | ED3 | 0.584 | | | |
| | ED4 | 0.588 | | | |
| | ED6 | 0.567 | | | |
| | ED7 | 0.602 | | | |
| | ED8 | 0.602 | | | |
| | ED9 | 0.648 | | | |
| | ED10 | 0.591 | | | |
| | ED11 | 0.673 | | | |
| | ED12 | 0.583 | | | |
| Fair Labor | FL1 | 0.595 | 38.839 | 0.929 | 0.918 |
| | FL2 | 0.612 | | | |
| | FL3 | 0.688 | | | |
| | FL4 | 0.678 | | | |
| | FL5 | 0.672 | | | |
| | FL6 | 0.664 | | | |
| | FL7 | 0.619 | | | |
| | FL9 | 0.588 | | | |
| | FL10 | 0.603 | | | |
| | FL11 | 0.646 | | | |
| | FL13 | 0.527 | | | |
| | FL14 | 0.616 | | | |

4.4 Second order confirmatory factor Analysis:

We used Amos 20 for second order CFA in order to test for a second-order model of SocS (Fig. 2). The second-order model proposed a latent factor that controlled the relationships between FL, WHS, and ED. There was a significant path connecting all three of the social dimensions (constructs) to the second order construct (SS). The second order loadings on social sustainability were 0.99 for workers health, 0.90 for equity and diversity and 1.02 for fair labor. Additionally, the SCSS second order model met all goodness of fit requirements. Chi-Squared Test: $\chi 2/df$ (CMIN) = 1.698, Goodness of fit index (GFI) = 0.956, non-normed fit index (NFI) = 0.882, Confirmatory fit index (CFI) = 0.953, and Root Mean Square Error Approximation (RMSEA) = 0.031 (Table 3).

We tested social sustainability's efficacy and predictive validity, which are both covered in more detail in the sections that follow, in order to bolster its importance as a secondary factor. Using the method described by Marsh and However in 1985, we determined the target (T) coefficient, which is the chi-square ratio between the first and second order models, in order to evaluate efficacy. A more effective representation is indicated by a T coefficient greater than 1.0. The model-1 and model-2 chi-square values show that they are the same. Our second order construct effectively clarified the first order construct model, as indicated by a T coefficient that is close to 1.0. As a result, each model offers a clear illustration of how the other works. This outcome also implies that the two models are similar and that the first-order and second-order constructs are exactly the same. The model also reveals that Fair labor have peak path loading (r=1.02) after that workers health & safety (r=0.99) and equity and diversity (r=0.90). According to these findings, the dimensions of social sustainability that are most likely to exist are all three constructs i.e., WHS, ED, and FL.

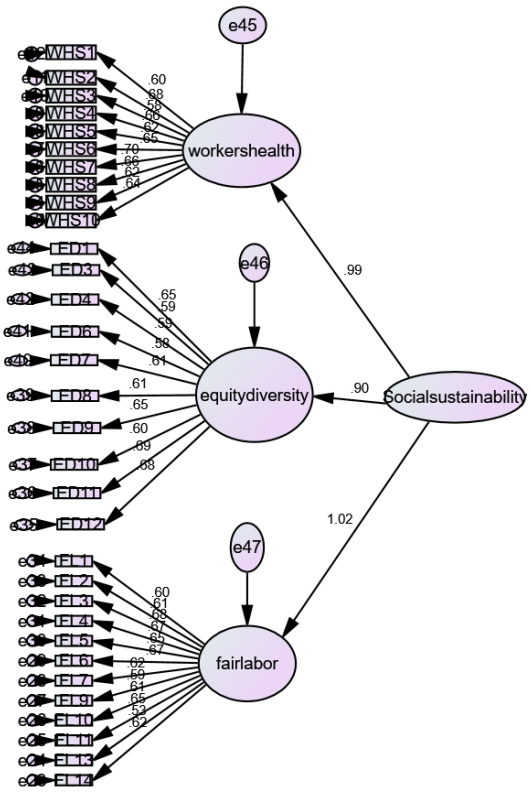

Figure 2: Second order confirmatory factor analysis model

Table 6: Second order CFA model tests:

| Chi Squared test: χ2/df (CMIN) | Goodness of fit index (GFI) | Non-normed fit index (NFI) | Confirmatory fit Index (CFI) | Root Mean Square Error Approximation (RMSEA). |
|---|---|---|---|---|
| 1.698 | 0.956 | 0.882 | 0.953 | 0.031 |

Table 7: Factor correlations are used to assess the factors' discriminant validity.

| **Factor** | **Mean (SD)** | **WHS** | **ED** | **FL** |
|---|---|---|---|---|
| Workers Health & Safety | 2.89 | 1.000 | | |
| Equity & Diversity | 3.81 | 0.286 | 1.000 | |
| Fair Labor | 3.09 | 0.145 | 0.235 | 1.000 |

Table 7: Items on the social sustainability scale and their corresponding metrics (after refinement) on a 5-point Likert scale (1 being strongly disagree and 5 being strongly agree).

| **Dimension** | **Item** | **Item loading** | **Measure** |
|---|---|---|---|
| Worker's health & Safety | WHS1 | 0.599 | Management and the workforce work together to tackle safety-related issues |
| | WHS2 | 0.674 | Workplace health and safety is considered extremely important. |
| | WHS3 | 0.578 | There is an active health and safety committee |
| | WHS4 | 0.658 | Every one receives compulsory health and safety training. |
| | WHS5 | 0.618 | Personal protection equipment (PPE) is provided by management. |
| | WHS6 | 0.715 | Management monitors if PPE is used and worn properly. |
| | WHS7 | 0.699 | Management Provides health insurance policies |
| | WHS8 | 0.667 | Safety inspection is done on regular basis. |
| | WHS9 | 0.623 | Pure drinking water facility at the workplace. |
| | WHS10 | 0.641 | Availability of clean toilets at the workplace |
| Equity & Diversity | ED1 | 0.637 | There is diverse environment in this cement plant. |
| | ED2 | ## | Management is hiring worker/labor from all communities. |
| | ED3 | 0.584 | HR and management of the plant are supportive towards disabled people. |
| | ED4 | 0.588 | Comfortable in discussing social & cultural background with teammates. |
| | ED5 | ## | Comfortable in sharing concerns with managers and supervisors. |
| | ED6 | 0.567 | Rehabilitation packages for displaced workers. |

| | | | |
|---|---|---|---|
| | ED7 | 0.602 | Faced discrimination in workplace due to cultural background. |
| | ED8 | 0.602 | Management educates the workers regarding equity and diversity. |
| | ED10 | 0.648 | There are policies and producers to prevent and address discrimination. |
| | ED11 | 0.591 | Faced retaliation for reporting discrimination from the management. |
| | ED12 | 0.673 | The management team handles the matters related to equity satisfactorily. |
| Fair Labor | FL1 | 0.583 | Accommodation facility is provided by the management. |
| | FL2 | 0.688 | Satisfied with my salary/Wages. |
| | FL3 | 0.678 | Salary/Wages provided on time. |
| | FL4 | 0.672 | Receive rewards and recognition for best performance from the owner. |
| | FL5 | 0.664 | Satisfied with the support from HR department. |
| | FL6 | 0.619 | Get motivation from the management. |
| | FL7 | 0.588 | Provident fund facility is provided by management. |
| | FL8 | ## | Gratuity is paid at the end of the service |
| | FL9 | 0.588 | Tripartite relationship between employer, employee and union exists. |
| | FL10 | 0.603 | Job security exists in the plant. |
| | FL11 | 0.646 | The management involves in decision making which is relevant to my department. |
| | FL12 | ## | work more than 7 hours in a day |
| | FL13 | 0.527 | Have less working hours in winter. |
| | FL14 | 0.616 | Have more working hours in summer. |

## indicates that the factor loading is lesser than cut-off value (0.5).

5: Discussion

We examine the consequences of our research for the social sustainability of cement industry scale development, as determined by exploratory and confirmatory factor analyses (CFA and EFA, respectively). The three main concepts being examined—fair labour, equity and diversity, and workers' health and safety—offered a thorough framework for assessing the social impact of the sector (Mishra et, al, 2022; calderon, 2023; Honneth, 2023). Through our investigation of these concepts, we were able to comprehend the intricate connection between the cement industry and social sustainability on a deeper level. The EFA highlighted areas for improvement and illuminated potential interdependencies by revealing underlying patterns and relationships among the items within each construct (khreisat & Mugableh, 2020). The CFA then provided a thorough validation of our suggested model, confirming the dependability and resilience of the chosen indicators (Tarhan et,al 2021). The convergence of the results from the two analyses validates our assessment and highlights the significance of promoting diversity and equity, ensuring fair labour practices, and attending to workers' well-being in order to support the social sustainability of large-scale developments in the cement industry. These findings give useful information to the continuing discussion on sustainable industrial practices and offer stakeholders practical advice on how to improve the industry's social responsibility.

6. Policy implications:

For managers actively involved in Cement Industry Social Sustainability (CISS), these suggested dimensions and measures offer a thorough framework and practical insights to help develop and execute successful CISS strategies. The tool was created based on the experiences of workers in the cement industry in Kashmir. It is not only a useful tool for managers in the cement industry in developing nations and emerging economies, but it also advances our knowledge of how to gauge the social performance of the cement industry as a whole.

Managers can make well-informed decisions and develop strategic plans by implementing our recommended dimensions, which will provide them with a nuanced understanding of the social impact and performance of their company. Moreover, the perspectives gained from the experiences of Kashmiri workers in the cement industry provide a distinct viewpoint that is especially pertinent for areas dealing with comparable socioeconomic difficulties.

Our suggested dimensions offer a benchmarking tool to evaluate and improve current practices for companies looking to improve their social sustainability policies. This comparative study can point out opportunities for innovation and improvement, encouraging ongoing progress in social sustainability both inside and outside the cement sector.

## 7. Conclusion:

In the framework of the cement industry in Kashmir, this study defined, conceptualised, and empirically investigated the dimensions and metrics of Cement Industry Social Sustainability (CISS). Based on the first-hand experiences and viewpoints of employees in the cement industry in Kashmir, we have created a thorough 38-item SS scale. We add to the body of knowledge on sustainability in the cement industry by developing, evaluating, and validating three unique dimensions and related metrics that improve our understanding of CISS.

Although this study offers insightful information about the social sustainability of the cement industry, it is imperative to identify some loopholes that should be taken into account when rendering the results. First off, since the study is restricted to the Kashmir region, care should be taken when extrapolating the findings to the entirety of India. It is imperative that future research endeavours to achieve a more extensive nationwide representation in order to pledge the wider relevance of the outcomes. Furthermore, it's possible that the entire range of variables affecting social sustainability in the cement industry is not taken into account by our concentration on just three aspects of social sustainability: fair labour, equity and diversity, and workers' health and safety. Further investigations may delve into other aspects to furnish a more comprehensive comprehension of the intricate interactions among the variables at play. Additionally, the majority of the data for this study came from worker interviews, providing a frontline viewpoint. Future research should broaden its scope to incorporate viewpoints from a variety of stakeholders, including management, community representatives, and regulatory bodies, in order to achieve a more thorough and nuanced understanding. This will enhance the depth and breadth of insights into the nuances of social sustainability within the cement industry.

## Authors Contribution

*Syed Rizwana Qadri*: Conception, design, drafting-, data collection, and interpretation of the manuscript.

Hakam Chand: writing, drafting of the manuscript

*Mudasir Ahmad Dar*: Conception and drafting of the manuscript.

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## Data Availability and statement.

We hereby declare that the author (Syed Rizwana Qadri) has access to the data supporting this work and that the data will be made available for research purposes upon reasonable request.

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There was no disclosed conflict of interest by the author(s).

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