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Supplier selection using social sustainability: AHP based approach in India

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ABSTRACT

For over a decade, sustainability has been a major concern for organizations as awareness about environmental degradation, natural resource depletion and climate change has increased. In addition, voices raised by social organizations on various social and environmental issues in developing countries have forced organizations to focus on sustainable manufacturing practices. This research mainly focuses on socially sustainable supplier selection through social parameters by using the analytic hierarchy process (AHP) in decision making. This methodology demonstrates the development of social sustainability indicators, including equity, health, safety, wages, education, philanthropy, child and bonded labour which are validated by experts. The study also describes how the above mentioned metrics may be used to prioritize alternatives for decision making using AHP. The study further demonstrates practical applications of social sustainability dimensions in selecting suppliers for manufacturers operating in emerging economies. Three case studies illustrating this methodology have also been included. The case studies further analyse the results of the methodology along with the tradeoffs supply chain managers make. Findings show that manufacturers of electrical, automotive and cement industries were able to select suppliers based on the social sustainability score. This study helps supply chain managers integrate various social dimensions into the supply chain function. The results of the study draw the attention of all stakeholders towards social dimensions by necessitating the importance of social conditions upon suppliers.

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1. Introduction:

The study of sustainable supply chain management has gained momentum during the past two decades. Although the studies focus on the three pillars of sustainability Elkington [35] - economic (profit), environment (planet) and social (people), the social aspect has not been explored much due to the “humanness” and the difficulty in getting tangible outcomes

from it [16, 4]. On one hand, there are measures such as the Sarbanes-Oxley Act, the Dow Jones Economic Index (1896) along with other financial reporting standards that require corporations to be economically sustainable, and on the other hand, tremendous research has been done on the environmental aspects of sustainability in the supply chain and regulations such as ISO 14001, REACH, CTS, EMAS etc. have been framed for green sustainability. However, very little has been done in terms of social sustainability in the supply chain because of very complex

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human issues involved [90, 4]. While the Brundland definition (1987) described environmental and social aspects together, specific research on social aspects was very limited. The focus was regained after the UN's Rio conference in 1992 which emphasized the human aspects of sustainability in its Agenda21.

Social sustainability has increasingly been gaining momentum amidst strong voices being raised for social issues that hold not only the stand alone corporation responsible, but also other partners in the system. One such important stakeholder is the supplier; suppliers are becoming an integral part of a bigger value chain network. Many a time, unethical actions of suppliers impact the corporate image and business significantly. For instance, McDonald's, the largest fast food supply chain came under fire because of "expired meat" supplied by its vendors to McDonald's restaurants in China. This resulted in the suspension of burger products in Shanghai, China and US. The image of the corporation was tarnished because of the acts of the supplier. Yet another case of unethical practices came to light in US hospitals, where patients were billed for unwanted medical procedures that resulted in huge fines imposed on such hospitals by the US government. The US government also created the Health Care Fraud Prevention and Enforcement Action Team (HEAT) for regulating frauds in hospitals. These are just a few of the many incidents that came to light due to the pressure from social organizations. All these unethical and unsafe practices have stained the image of the corporation and such problems cannot be ignored [83].

In developing countries, there were numerous other instances. For example, most of the "shrimp" sold in Wal-Mart stores were procured from a Thailand based supplier "Matsushita" between December 2005 and November 2006. The working environment in this manufacturing unit was so bad that workers were not provided even basic amenities such as health, safety, sanitation, hygiene, drinking water etc. Further, they were forced to work as bonded labour. This was questioned and highlighted by NGOs and human rights activists [22]. India is ranked among the top four manufacturing destinations in the world because of the low cost and availability of skilled manpower. However, the recent discovery of over 2.7 lakh child and bonded labourers across the country put the country on the back seat [74]. The majority of these incidents highlight the failure of the upstream supply chain involving suppliers and their installations. Corporations need to be more prudent in auditing their supplier base to avoid such unwarranted problems which not only affect the business, but also the brand image. More recently, in developing countries, the awareness created by various stakeholders and social organizations on wages, employment, equity, safety and living conditions mandated the companies to find ways and means of socially sustainable manufacturing and sourcing practices. Many of the multinational corporations operating from the western parts of the world depend on developing countries for supplies because of the low cost advantage. Most of the developing

countries are plagued with various social issues such as living conditions, safety, health, poverty, child and bonded labour etc. [10, 82, 107]. Nevertheless, supplier selection in emerging economies is an important decision corporates need to make to achieve strategic advantage. In manufacturing, supplier selection plays a vital role among other dimensions [62]. Though many scholars explored methods for supplier selection based on essential supplier selection parameters such as cost, reliability, lead time and environment, the usage of social sustainability parameters was explored less. The authors attempt to address this gap by exploring various social sustainability parameters and determining how these parameters can be incorporated in supplier selection. This research is amongst the very first studies carried out in socially sustainable supplier selection as extant research on social sustainability in the supply chain is qualitative in nature and more of a case study [90]. Therefore, the aim of this research is twofold: one, to find out what are the social sustainability parameters that can be applied to the supply chain, and two, to determine how these parameters can effectively be used in supplier selection? Answers to these questions can fill the above mentioned gap by addressing social sustainability issues in the supply chain. This could be a significant contribution to the existing supply chain literature, especially related to the supplier selection problem. Hence, the authors frame the objectives as follows.

- a) To identify various socially responsible supplier selection criteria, sub criteria and indicators.
- b) To develop and propose an AHP methodology in selecting socially sustainable suppliers.
- c) To conduct a pilot test in three organizations to validate the AHP model.

This paper is divided into four sections: literature review, methodology, application of AHP and discussion, and conclusion.

2. Literature Review:

The literature review comprises four different sections that include evolution of social sustainability, application of social sustainability in the supply chain, the importance of socially sustainable supplier selection and the importance of socially sustainable supplier selection in emerging economies.

2.1 Social Sustainability:

The philosophy of sustainability was found in the reports of the Brundland Commission [12] "Our Common Future: The World Commission on Environment and Development". However, sustainability and its importance were discussed well before, during the UN Stockholm Conference held in 1972. The Brundland Commission defined sustainability as "meeting the today's needs of people without compromising the needs of the future generations" [12]. The Brundland Commission report much emphasized on sustainability only in terms of the resource based view, but not in terms of society, people and culture

[23]. Another scholar in his research advocated three important aspects of sustainability: environment, longtime focus on environment and equity [79]. Later, a similar study conducted by a few researchers argued that sustainable development also ‘embraces the need for equity’ [34]. Many authors have also concurred with the view that for the enterprise to be sustainable, it needs to internalize social costs, grow and maintain capital stocks, foster democracy and enlarge peoples’ choices and distribute property rights fairly [43]. The United Nations Conference on Sustainable Development [96] has specified in Section 1 of Agenda 21 (Economic Dimensions), promotion of economic growth; in Section 2 (Social Dimensions), creation of productive employment and achieving equality; in Section 3 (Environmental Dimensions), reduction in the use of natural resources and protection of the natural environment. Later, many scholars did extensive research on social sustainability; notably, Sachs [85] and Godschalk [44], through their research titled “Social Sustainability and Whole Development” identified a number of essential elements including equitable income and access to goods, social homogeneity and services and employment. Sachs [85] also pointed out the importance of ‘cultural sustainability’ which required balancing externally imposed change with continuity and development from within, and of ‘political sustainability’ based on human rights, democracy and effective institutional control. Again, social responsibility was seen as an organization’s ability to manage stakeholders [102, 22]. Many scholars through their research attempted to define social sustainability. To name a few, Lafferty and Langhelle [66], Sharma and Ruud [91] defined social sustainability as a human code of conduct which needs to be achieved in an equitable, inclusive and prudent manner. Wackernagel [101] pointed out the importance of social sustainability by saying: “human health aspects are essential for the well-being of a society, but they should not be confused with environmental sustainability”.

Yet some scholars identified social sustainability with corporates, for example Dyllick and Hockerts [32] provided one representative definition of corporate sustainability: “meeting the needs of a firm’s direct and indirect stakeholders (such as shareholders, employees, clients, pressure groups, communities, etc.), without compromising its ability to meet the needs of future stakeholders as well”. Dyllick & Hockerts [32] emphasized the necessity of social sustainability on corporations and suppliers by adding value through an increase in human capital and societal capital of communities. Later, Bramley & Power [11] asserted that social sustainability was often equated with social cohesion, social capital and social inclusion. This also underlines the importance of focusing on higher needs such as access to necessary goods and services, and basic societal development. Some researchers have also emphasised providing intra and inter-generational equity and distribution of power, employment, resources, education, freedom, provision of basic infrastructure and services, justice, and access to influential decision-

making fora [11, 73, 58, 82]. Bansal [7] described social equity as an important component of social sustainability and asserted that all members of society had equal access to resources and opportunities. Social equity also extended to the fair and equitable treatment of employees [63]. Vallance [100] in his research titled “What is Social Sustainability” described a three fold literature schema comprising: (1) development sustainability addressing basic needs and creation of social capital, (2) bridge sustainability concerning behavioural changes to achieve bio and physical environmental goals, and (3) maintenance sustainability, which refers to social and cultural characteristics such as ways in which people actively resist or embrace change. On the basis of the studies mentioned above and their outcomes, it is clear that social sustainability is all about social issues and the ways in which they can be addressed which may in turn lead to sustainability. Since this study focuses on supply chain related social issues, various social aspects that are specifically related to the supply chain are identified in the next section.

2.2 Social Sustainability in the Supply Chain:

Social sustainability seeks different ways of integrating the human and social aspects into the supply chain. This implies protecting people from the effects of products and processes that negatively impact a human being’s safety, health and well-being. However, before defining social sustainability in the supply chain one needs to understand “who need to be targeted”? What issues are to be addressed? And how they need to be addressed? [106]. Stakeholder theory answers the first question that all stakeholders in the supply chain, including suppliers, employees, society, NGOs, customers and channel partners should be addressed [40,41,94,14]. As for the issues that need to be addressed, many eminent scholars identified various social issues in the supply chain. For example, Emmelhainz and Adams [36] described the importance of human rights and labour conditions in the supply chain. Carter & Jennings [17,18,19] emphasized on health and safety, diversity, philanthropy, human rights and ethics. Later they proved that ethics cannot be used as a social dimension in the supply chain. Similar research done by many other researchers insisted on various human issues that included safety, health, diversity, working conditions, labour practices, child and bonded labour, and poverty in the supply chain [105,15,71,61,99,2]. Later, the criteria of fair and equitable treatment, human rights, child and forced labour, employment and wages and training in supply chain were addressed by ILO practices [78]. Hutchins & Sutherland [56] through their study identified various social parameters and indicators such as health, safety, philanthropy and equity to measure social dimensions. They also described how these criteria and sub criteria played a vital role in social sustainability of the country through life cycle analysis. Labuschagne [64] revealed practices related to poverty alleviation, administering justice, human rights, and welfare of all employees in the supply chain. Leire and

Mont [67] explained how these dimensions were linked and incorporated in the supply chain by reducing unemployment, protecting employee health and safety, ensuring equal treatment and preventing social exclusion.

Many authors have explained through various studies, ways in which social issues can be addressed in the supply chain. One such approach is socially responsible buying (SRB). Socially responsible buying (SRB) refers to the incorporation of social issues in purchase decisions advocated by organizational stakeholders [72]. Carter and Jennings [17,18,19] pointed out the role of purchasing managers in the area of social responsibility within the supply chain and how the enactment of these roles could lead to improved trust and supplier commitment through purchasing social responsibility (PSR) and logistics social responsibility (LSR) [24]. Later research by Leire & Mont [67] indicated how social criteria could be used to monitor suppliers and ensure their compliance. Goworek [46] in his research emphasized on the ways socially responsible and environmentally sustainable sourcing practices could be applied to clothing industries. Socially responsible supplier development (SRSD) and its importance in measuring the buyer's sustainability, and the relationship between social sustainability and supplier development efforts were established in china [68].

Another aspect of social sustainability in the supply chain deals with ways in which these social issues can be incorporated therein. Many renowned authors have tried identifying ways and means of integrating social parameters into the supply chain. For example, one researcher asserted that socially responsible organizational buying fully depended on two factors: first, the skillfull policy entrepreneurs who institute new policies with zeal for social wellness in their policy decisions, and second, the organizational context in which decisions are made [31]. There have been many other studies focusing on how social sustainability can be achieved if corporate enact their roles responsibly. Drumwright [31], Clarkson [25], Strong [95], McWilliams [72], Campbell [14] along with Ehrgott *et al* [33] argue that various parameters such as customer requirements, stakeholder requirements, employee requirements, skilled policy entrepreneurs, economic status of corporates, and public and private regulation influence social sustainability adoption. Though many authors have attempted to incorporate the social aspects of the supply chain through purchasing social responsibility (PSR), logistical social responsibility (LSR) and socially responsible supplier development (SRSD), supplier selection using social sustainability was not explored because of complex human issues involved in it. Further, the social sustainability parameters are highly contextual and vary from country to country. Recently, corporates have started incorporating green sustainability criteria by including some new criteria in addition to other supplier selection criteria. Similarly, very few companies emphasize social criteria by mandating health and safety mechanisms (OHSAS

18001). However, there is no comprehensive list of social parameters which can be used to select a supplier. The authors address this problem by identifying various social parameters and highlighting their importance in the following sections.

2.3 Importance of Socially Sustainable Supplier Selection:

Traditionally, supplier selection mainly focused on price, flexibility and quality while evaluating the performance of the suppliers [103,30]. Now a days, in addition to these parameters, sustainability plays a vital role in the supply chain as the purchasing process has become more complex due to environmental and social pressures [5,6]. Supplier selection, monitoring and auditing are far more important than supplier integration and development for improving sustainability performance [89]. It is also evident that focus on social dimensions in the supply chain has been in abeyance for a long time and much needs to be done [90]. Big multinational organizations, given their bargaining power coupled with control on key resources in their supply chain demand product specifications and conditions; as to what and where and how should be produced [42]. These organizations may even provide technical assistance to enhance their performance to become more competitive in the market. Because of their size [57], all the northern buyers are controlling the entire chain of south suppliers. This also implies the fact that these companies not only have a moral responsibility to control the date and time of delivery, but also enforce the environment and social conditions in which it is produced. In supply chain, there has been a procurement code of conduct in existence since 1990 between corporations and suppliers and the number of such codes of conduct has grown phenomenally since then [51, 104]. These codes of conduct are documents specifying procurement procedures and social environmental aspects that the supplier needs to adhere to [57]. Maignan *et al.* [69] explained how socially responsible buying practices help in improving the company's image and stakeholder value which ultimately leads to social sustainability. Multinational companies are not only expected to behave in a socially responsible way, but are also responsible for environmental and labour practices they employ in their supply chain [57, 71]. Social responsibility concepts in the supply chain are increasing, although supply chain managers have been slow in adopting these concepts [75]. Implementing environmental and social sustainability measures within the supply chain leads to sustainability [86]. Yet some scholars voice the importance of supplier selection practices as "practicing social responsibility not only be embedded in the companies, but also subsidiaries and the supplier and their selection practices, it includes training the employees of suppliers on offshore locations" [2]. Because of increased pressure from stakeholders, NGOs and regulatory authorities, it has become very essential for corporates to incorporate the social aspects of the supply chain which in turn give them sustainability in the long run. Therefore supplier selection plays a key role in bringing overall sustainability to the firm. Though

various scholars have described many ways of incorporating social sustainability in the supply chain, the incorporation of social parameters in supplier selection has been least explored. As the multinational companies set up their sourcing hubs in developing economies because of the low cost advantage, it is essential to identify and address social issues prevailing in these economies. One such attempt is incorporating social sustainability in supplier selection. The authors attempt to find out the reasons behind its relevance to the emerging economies in the next section.

2.4 Why Developing Countries?

Due to globalization, many developing countries are increasingly transforming into manufacturing hubs; these hubs are not only concerned with the environmental aspects of business, but have also started considering social issues such as safety, working conditions, wages, child labour, human rights and poverty [61]. Pressures from internal stakeholders and external actors are forcing companies to behave in a socially responsible manner. These companies are not only aware of their positive social image and the customer's positive buying behaviour, they also know the negative behaviour of the socially non performing companies [88]. The United Nations Human Development Index (HDI) rates the countries based on life expectancy, income and education, which in turn makes the countries more socially responsible. Additionally, the HDI ratings directly affect the international growth of developing countries. Most developing countries score very low on social issues in the human development index (HDI) because of persisting social problems. Hence, big corporates with their bargaining power should be able to incorporate social sustainability criteria in their supplier selection and monitoring processes which would not only enhance the performance of the buyer company but also help in the overall social development of the country.

Therefore, social sustainability practices in the supply chain of developing economies are a matter of importance for decision makers. They also need to understand the social parameters relevant to these countries and how they can be incorporated into supplier decisions. In the next section, the authors attempt to explore the incorporation of social sustainability parameters in supplier selection using the AHP methodology.

3. Methodology:

The methodology is explained in two different sections: the first section describes the importance of AHP in supplier selection, and the next section explains the process of AHP. Before getting into the AHP method for supplier selection, the social sustainability parameters were identified through literature review and the Delphi process. The Delphi process has been discussed in detail in later sections.

3.1 Supplier Selection and AHP.

The supplier selection function in organizations is more complicated in a

way that many supply chain criteria, including quality, delivery performance, production facilities, warranty claims, price and technical capabilities need to be applied [29]. Because of increasing awareness on sustainability, the development of social and green aspects of the supply chain is also becoming necessary [5, 6]. The supplier selection issue has been addressed by many researchers from the perspective of environmental sustainability. In fact, researchers have used environmental and economic parameters extensively while the social sustainability parameters have not been explored much [5, 6, 37, 49, 52, 54, 55]. Because of increasing social issues, and the growing importance of social sustainability aspects, an attempt has been made to identify various social dimensions and parameters which can be used effectively in supplier selection. Bai & Sarkis [5] used various social sustainability criteria, including equity, diversity, discrimination, safety and health in supplier selection using grey system rough set method. Similarly, Amindoust *et al.* [1] used social criteria such as rights of employee, rights of stakeholders, and health and safety issues in supplier selection. Various scholars in similar studies for supplier selection used many other social criteria [53,13]. However, the social criteria vary from country to country and are highly contextual. The various social criteria relevant to India were identified through the Delphi group study. The results are explained in the next section. Through this research, the authors seek to include social sustainability parameters and their usage in supplier selection which could be a vital contribution to the existing supply chain literature. In order to apply social criteria and sub criteria along with their weightage in supplier selection, the authors have used a methodology known as analytical hierarchy process (AHP). The various steps involved in the AHP are explained in detail in the following section.

3.2 AHP Process:

Analytic hierarchy process (AHP) was introduced by Saaty [84]. It is a technique used to measure the qualitative and quantitative factors in decision making. It helps and facilitates decision making based on judgments, feelings, memories and other forces that may influence decision making at multilevel hierarchy structures [9]. The advantages of AHP include its ability to reconcile differences (inconsistencies) in the data and the existence of easy to use commercial software "Expert Choice" that does all mathematical calculations required in accordance with multi criteria decision making. In AHP, first the decision making criteria are decided and grouped, followed by determination of sub criteria and specific indicators for each of those criteria to be measured in a hierarchical structure. Then, the various alternative decisions are arrived at. Application of AHP involves four steps: First, the supplier selection problem is defined and objective specified. Second, the criteria and sub criteria that must be satisfied to achieve the objective are defined. Third, alternative decisions are arrived at. And finally, a decision is made. The objective is at the first level, criteria at second, sub criteria at third and

alternative decisions in the fourth in decision making. The decision criteria at the first level are compared in pairs with the help of a judgment matrix to determine how important one element is as compared to the other element. This comparison is made on a 9 point scale where 1 = equally important, and 9 = extremely important. Next, paired comparisons are made at all levels. As the comparisons are done subjectively, the consistence ratio (CR) is arrived at and the same being less than 0.1 will be more consistent with human judgement decisions. Cumulative judgement weights are computed at all levels to arrive at the judgement weight for alternatives. The final weight represents the weight of the alternatives in multi criteria decision making.

In this study, a group of managers involved in supply chain and purchasing operations was given a chance to state their preferences between criteria. In other words, the decision-team expressed their preferences between a pair of elements verbally as equally important, moderately more important, strongly more important, very strongly more important, and extremely more important. These preferences were then quantified applying Saaty's 1-9 scale and a pairwise comparison matrix was structured using "Expert Choice" software. Before starting the process of applying AHP, the authors formulated a Delphi group to identify the social sustainability metrics in this problem. The formation of the Delphi group and its work process is explained in the following section.

4. Delphi Group: Developing and Testing AHP

The authors identified an exhaustive list of social sustainability indicators as specified in table1 by doing a literature survey through Scopus, EBSCO, Elsevier (www.sciencedirect.com), Emerald (www.emeraldinsight.com), Springer (www.springerlink.com), Wiley (www.wiley.com), Taylor and Francis (www.tandfonline.com) and Inderscience (www.inderscience.com). Keywords such as sustainability, social sustainability, social sustainability dimensions, social sustainability indicators, social sustainability and supply chain, social sustainability dimensions in supply chain, social sustainability parameters, social sustainability dimensions and sustainability, and social sustainability in developing countries were used. To be more specific to the objectives of the study, the authors used journals published between 1990 and 2013 because social sustainability started gaining momentum only after the UN conference held in Rio in 1992. Out of 458 academic research papers, the authors picked 89 papers from various journals using parameters such as language (English), title, screening the abstract, relevance to management, duplication, etc. After a thorough reading of all these papers, a comprehensive list of social sustainability indicators was formed. These indicators were forwarded to academics in elite institutions. Their feedback was received along with suggested corrections and the same were incorporated to get the final list of social sustainable indicators (SSI). There were many social performance indicators and it was very

difficult to pick the right one (table1). Further, there were two problems that needed to be addressed: one, deciding which social factors out of the many social performance indicators should be applied to the supplier selection process, and two, constituting an AHP model to this problem. To solve these problems, the authors adopted the Delphi process explained in the next section.

Table-1

List of social performance indicators

Abuse and disciplinary practices	Human rights
Access to goods and services	Income disparity
Affordable housing	Justice for all
Bonded labour	Juvenile arrests
Child abuse or Neglect	Life companion
Child labour	Living wage
Creation of social capital	Objective basic needs
Cultural diversity	Objective equal opportunities
Cultural sustainability	Objective social resources
Employment	Philanthropy
Employment gender ratio	Population
Environmental reports	Poverty
Equity	Quality education
Fair distribution of burden between generations	Recreation
Ethics	Reliable and sufficient social system
Freedom of association	Financial position
Gender discrimination	Safety
Social homogeneity	Subjective basic needs
Gender ratio (Employment)	Subjective equal opportunities
Harassment	Subjective social resources
Health	Housing Security
Health Insurance	Working Hours
Wages	

Source: Poist [80], Mitlin & Satterthwaite [73], Basiago [8], Nahapiet & Ghoshal [76], Sachs [85], Carter *et al.* [21], Emmelhainz & Adams [36], Polèse & Stren [81], UNDSO [97], Spangenberg & Omann [92, 93], Carter and Jennings [17, 18, 19], SCHLOSSBERG & ZIMMERMAN [87], Whooley [105], Halme *et al.* [48], Carter [15], Foladori [39], Hens & Nath [50], Källström & Ljung [58], Redclift [82], Crabtree [28], Evans *et al.* [38], Colantonio [26], Maloni & Brown [71], Yakovleva [108], Yakovleva *et al.* [109], Kortelainen [61], Hutchins & Sutherland [56], Vachon & Mao [99], Andersen & Skjoett-Larsen [2], Bramley & Power [11], Carter & Easton [16], Kogg & Mont [60], Gopalakrishnan *et al.* [45], Lu *et al.* [68].

In order to come up with the correct social sustainability indicators (SSI), a three stage Delphi process was adopted. First, a group of supply chain managers was identified; these were experts from top automotive and

electrical organizations and computer hardware manufacturing corporations, including fortune 500 companies such as Canon, Hyundai, Volvo, Suzuki, Honda, Hewlett Packard, Toyota, Wipro, TVS Electronics, etc., in South Asian countries (Applying Delphi method to operations) [70, 49]. Officials of these companies were telephoned to understand the use of social performance indicators in their supply chain. The telephone interviews were conducted from Aug 2013 to Nov 2013. Though they have been practicing social sustainability, there was no structured way of integrating these parameters in the supply chain. Managers in these companies were also unsure of which parameters to use to measure social sustainability in the supply chain. Also, these groups of managers and executives were asked to qualitatively specify various social and sustainable parameters they used in their supply chain to select the suppliers. While giving their input, many of the managers also expressed confusion over how to integrate “socialness” in the supply chain. After the first round of qualitative feedback from the participants, an exhaustive list of qualitative statements indicating SSIs was prepared and displayed to the participants in the second round and they were asked to rate these statements. Based on their responses, the authors arrived at a refined list of indicative statements and with reasons as to why they were preferred over the others. Finally, these statements were grouped and ranked based on their importance as indicated by participants to arrive at the more comprehensive SSI list exhibited in table2.

4.1 Social Sustainability Indicators:

Social sustainability indicators vary from country to country based on country specific social dynamics. Sachs [85] identified many social sustainability indicators through his empirical study in New York City in which he emphasized access to goods, employment, cultural sustainability and human rights. Carter and Jennings [17, 18, 19] established many SSI indicators such as diversity, philanthropy, safety, human rights, trust and co-operation through a PSR relationship in the supply chain in the US. Omann & Spangenberg [77] explained the importance of objective basic needs, subjective basic needs, objective social resources, subjective social resources, cultural diversity and social security systems through their multi criteria decision making study in Germany through which they identified important social dimensions and ranked them based on priority. Carter [15] used philanthropy, safety and human rights as social sustainability variables in the supply chain. However, he could not establish a direct relationship between PSR and social sustainability (cost reduction), he instead established a relationship between organizational learning and supplier performance. Gupta [47], through her case studies pointed out the success of corporates in employing social sustainability measures such as human rights and labour standards in Indian companies. Other indicators such as financial position, life companion and recreation were used by Kallstorm & Ljung [58]. There was another empirical study done in Canada in which labour, employment and gender were used as

SSI's [99]. Hutchins' and Sutherland [56] established relationships between the financial position of a country and social sustainability indicators such as wages, health, safety, equity, quality education, philanthropy through life cycle analysis in the US. Various other studies conducted by researchers in different countries, including the UK, Sweden, London and China established various social performance indicators such as ethics, environment, employees, compensation, philanthropy, child labour, bonded labour, housing facilities, etc. [109, 60, 87, 2, 68]. Though many researchers have identified various social performance criteria, they cannot be used universally as the dynamics of society vary from country to country. Hence it is necessary to identify the social criteria relevant to a particular country. The authors attempt to identify these criteria through the Delphi process as explained in the next section.

Table-2

Social sustainability indicators ranked based on Delphi group.

<i>Most important</i>	<i>Optional indicators (Developing countries)</i>
Equity	Gender ratio (Employment)
Health	Life companion
Quality education	Child abuse and neglect
Housing security	Health Insurance
Population	Affordable housing
Safety	Income disparity
Philanthropy	Poverty
Human rights	High school dropout rate
Ethics	Working hours
Wages	Freedom of association
Employment	
Child labour	
Bonded labour	
Gender Discrimination	

Source: Delphi group outcome

4.2 A model of supplier social performance

It is clear from table2 that most of the supply chain managers are aware of the social performance indicators very closely associated with their company's competitiveness in the global market. These metrics include equity, health and safety, quality education, philanthropy, human rights, ethics, wages, bonded labour and gender discrimination. However, the Delphi group also expressed other social performance indicators which they felt could be incorporated, but were given less importance. These indicators include living wage, poverty, affordable housing, health insurance, recreation, cultural sustainability and so on. The group felt that wages and bonded labour, and health and safety were key indicators many of the group members had been practicing for years, and were directly related to the customer and supplier relationship. Some of the criteria were

considered too vague and time consuming to measure directly, so they were eliminated. Using the Delphi group input, the authors created a more refined model with a set of consolidated criteria more important to social sustainability. These metrics can easily be modified to fit the strategic objectives of the buying company. For example, if the company strongly practices elimination of child labour, and lays much emphasis on safety and health, these metrics could be incorporated in supplier selection and buying decisions. Also, if one supplier practices and gives priority to wages and human rights and gender discrimination over others, he should be rated accordingly based on the policies of the buyer company which essentially result of the company's strategic position.

Results of the inputs given by the Delphi group are listed in table 2 which describe the essential social performance criteria which are more important in a buyer and supplier relationship. Each of these attributes may be more or less important in developing assessment criteria for a particular supplier's social performance. This model is more generic in that it can be used by any industry for supplier assessment. For example, under manufacturing conditions, some measures such as life companion, recreation facilities, living wage etc. would not be relevant for a particular supplier process and can easily be removed without losing model validity. Figure 1 describes a structured decision tree model in which all the social criteria are listed at the top of the hierarchy and below each criteria, different metrics are listed to measure each social criteria. Analytic hierarchy process, then aggregates these weights and preferences and produces importance rankings and social performance indexes for each supplier; these indices range from 0 to 1, the total of all indices being 1. This model can be used as a social performance rating for a supplier in the traditional supplier evaluation system.

Table-3

Supplier social performance attributes of Delphi group

<i>Criteria</i>	<i>Sub criteria</i>	<i>Indicators</i>
Equity	Poverty	Percentage of population living below poverty level
		Unemployment rate
		Gini index of income inequality
Health & Safety	Gender Equality	Percentage ratio of average female wage vs male wage
	Gender Discrimination	The practice of granting or denying rights of privileges based on gender
	Nutritional status	Children nutritional status
Health & Safety	Mortality	Mortality rate under 5 years old
	Sanitation	Population who have

Adequate sewage facilities	Drinking water	Access to safe drinking water
	Health care delivery	Access to primary health care facilities
	Safety measures	Safety measures undertaken by the company to protect the employees
Wages	Wage standard	Standard of wages against man hours spent
	Education	Literacy level Adult literacy ratio Education level Access to primary education up to 5 th STD
Philanthropy	Donation to Temples & MUTT	Money offered to religious organizations
	Donations to NGO's	Money given to Non Governmental Organization (NGO's)]
	Donations to Schools & Colleges	Money given to schools and colleges
Human rights	Human rights	How human rights are protected (right to associate, speak)
	Child and bonded labour	Child labour Percentage of child and bonded labour employed Bonded labour Percentage of bonded labour employed
Housing	Living conditions	Human and floor ratio Hygienic conditions
Ethics	Supplier ethics	Ethical values adopted by the supplier
	Ethical environment	Ethical environment Set up

5. Results and discussion

The authors conducted three pilot studies in different companies to illustrate the use of the AHP model in selecting the socially sustainable supplier. The purpose of these pilot tests was to assess the usefulness of the AHP model in supplier evaluation practices as well as assess its strengths and weaknesses in different purchasing environments. Though many companies were applying social measures in their manufacturing units, they were not sure about the use of these parameters in the AHP model for supplier selection.

Since AHP in supplier selection using social sustainability criteria is a new attempt that needed validation in real environment, the authors chose 3 different firms wherein the three pilot tests were conducted. The firms were engaged in electrical, automotive and cement manufacturing and were chosen by the authors because of their economic importance. The details of the test results are given in the following section.

5.1 Pilot test-1 Heavy Electrical Manufacturer

The first pilot test was conducted with the purchasing manager of an

Indian heavy electrical manufacturer. This is the largest engineering and manufacturing company with its presence spanning over 5 decades in India. The company has installed utility sets of 106202 MW across the globe (till 2013). The company has 15 manufacturing divisions that manufacture 180 products in 30 major groups and has over 1000 suppliers across the globe. The analytic hierarchy process (AHP) model was presented to the manager, and details regarding specific criteria and social performance metrics were discussed. The queries related to AHP and metrics were answered. Three major suppliers for electrical valve manufacturing were chosen to work with, and to bring out the social sustainability score. The result of the pilot study is shown in table 4. The social performance score of supplier number 3 was 0.446, followed by supplier number 1 with a social performance score of 0.307, and supplier number 2 with a social performance score of 0.247. The social performance of supplier number 3 stands out distinctively across all dimensions, as the supplier fulfils all sustainable performance metrics unlike others. These scores will be added to other broad supplier selection parameters such as price, lead time, quality and reliability to get the overall score of the supplier.

Supplier 3 scored higher in human rights, equity and child and bonded labour practices, which formed a very essential and integral part of the social sustainable policy of the heavy electrical manufacturing company. Health and safety measures are also important metrics followed by the company to evaluate and grade the supplier as a part of their supplier evaluation system. These metrics are used only after the supplier is enrolled with the company. They were very optimistic about the usage of social sustainability metrics in supplier selection in future. The results of this study were shared with the line manager heading the purchasing function, and he was pleased to see the results and appreciated the new method. He noted that they had not been using AHP and social parameters in their supplier selection criteria and that the tool helped in ranking and prioritizing social sustainability performance indicators in a much better way, thus aiding in decision making.

Table-4

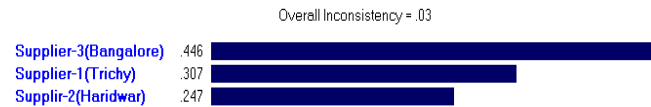
Supplier performance from pilot test-1

Criteria	Supplier-1	Supplier-2	Supplier-3
Equity	0.315	0.218	0.466
Health and Safety	0.266	0.302	0.432
Wages	0.346	0.231	0.423
Education	0.297	0.211	0.492
Philanthropy	0.247	0.317	0.436
Human Rights	0.249	0.158	0.592
Child and Bonded Labour	0.350	0.226	0.450
Housing	0.324	0.226	0.450
Ethics	0.334	0.336	0.329

Figure-1

Results from pilot test-1

Synthesis with respect to: Goal: Socially Sustainable Supplier Selection



Source: Analysis done through "Expert choice"

5.2 Pilot Study 2: Automotive Manufacturer

The second pilot test was conducted in a Japanese automotive company having 3 decades of experience in the automotive industry. The company has the capacity to produce over 12 lakh units of passenger cars annually. The total revenues of the company amount to \$ 426,448 million and it is the largest automobile manufacturer with over 50% market share in India. It has over 279 suppliers from China, India and Japan. The results of the test are shown in table 5 where both the suppliers fared more or less equally; the purchase managers rated both the suppliers equally since it was mandatory for all the suppliers to follow the minimum social sustainability measures as laid down by "law of the land", which mandated them to strictly adhere to labour practices, safety and health measures, wages, and eradicating child and bonded labour practices. Both the suppliers were certified by OHSAS 18001: this certification is a proof of the occupational health and safety measures adopted in the manufacturing set up. The social sustainability score of supplier number 1 is 0.515 and that of supplier number 2 is 0.485, which is just a little less than the first supplier. This shows that both suppliers scored almost equally well in their social performance parameters. The authors also noted that these figures resulted from meticulous mentoring and constant supplier enrichment programs, promoted by the Japanese automotive company to ensure that best practices were followed by suppliers. This indicates that for well regulated companies, this tool may not be of much importance until they attempted an in-depth analysis through on-site evaluations. The focus of supplier number 1 on education was minimum, while supplier number 2 showed minimum efforts in this area as is clear from their social performance score from table 5. Finally, these scores will be incorporated along with other supplier evaluating measures.

Table-5**Supplier performance from pilot test-2**

Criteria	Supplier-1	Supplier-2
Equity	0.420	0.580
Health and safety	0.493	0.507
Wages	0.535	0.465
Education	0.369	0.631
Philanthropy	0.410	0.590
Human rights	0.481	0.519
Child and bonded labour	0.446	0.554
Housing	0.602	0.398
Ethics	0.559	0.441

Figure-2**Results of pilot study-2**

Source: Analysis done through “Expert choice”

5.3 Pilot Study 3: Cement Manufacturer

A third pilot test was conducted with a leading cement manufacturer. The company has over 3 decades of experience in cement production and had an installed capacity of more than 60 lakh tons per year till 2013. The company has a turnover of \$ 200 billion, with wide supplier networks from India and the Middle East. The manager was presented with detailed descriptions of social performance indicators and was asked to rate their importance and supplier performance. He rated 2 suppliers from 2 different territories; supplier number 2 scored 0.524 and ranked 1 in social performance followed by supplier number 1 with the social score of 0.476. Though the company had been following stringent social sustainability practices, it was not able to impose the same and ensure compliance of suppliers because “availability of raw materials” was scarce. However, both the suppliers chosen for the study scored well in equity, safety, child and bonded labour, but less in wages and ethics. This could be because of laxity on the part of the law enforcement agencies in supplier locations.

The results were shared with the Head, CSR. He admitted that though they had been aware of social sustainability measures, they were not sure about how these measures could be incorporated into the upstream supply chain in the evaluation and selection process. He also admitted that these measures would not only help the manufacturing companies become self

accountable for social sustainability, but also ensure total sustainability for the society. All three managers conceded that they learnt many social sustainability criteria and their importance in supplier selection. The AHP social sustainability model can be used in any industrial environment without losing validity.

Table-6**Supplier performance from pilot test-3**

Criteria	Supplier-1	Supplier-2
Equity	0.585	0.415
Health and safety	0.597	0.403
Wages	0.388	0.612
Education	0.488	0.512
Philanthropy	0.490	0.510
Human rights	0.510	0.490
Child and bonded labour	0.580	0.420
Housing	0.461	0.539
Ethics	0.439	0.561

Figure-3**Results of pilot study -3**

Source: Analysis done through “Expert choice”

6. Limitations of the Model

The study included social, sustainable experts, CSR and supply chain managers in the Delphi process. But many purchase managers did not value all the social sustainability parameters presented in this model. Many improvements can be made by forming a new Delphi group comprising purchase managers from various organizations to determine social, sustainable metrics related to specific industries to get a more refined list of social, sustainability indicators which can be used as basic metrics for supplier selection in specific industries. This will help in ensuring the usability of metrics from a practitioner's point of view.

The second limitation of the model is data availability. In pilot test 2, managers had, based on their perceptions, rated both suppliers almost equally, which led to a skewed result. This shows that this model relies more on the managers' tendency of depending on available data than on the criteria for the supplier.

Resolving these social issues is not easy. Most of these social criteria are qualitative in nature and the weights assigned to them reflect the weights of the perceptions of managers. Since many of these metrics are socially desirable, many suppliers tend to give socially appropriate answers in the

suppliers' evaluation sheet which is why purchase managers ought to visit the sites to obtain actual metrics so that they are worth incorporating in decisions.

7. Extensions of the model:

The AHP model can be extended to all industries irrespective of their nature and location. All the metrics can be refined further, according to the social dynamics of the country and its laws. These models can be applied to supplier evaluation and selection systems along with other selection matrix. For corporates to attain overall sustainability, incorporating these metrics in their upstream and downstream supply chains will change the way business is done, which can lead to long time

8. Conclusion

Social sustainability practices in the supply chain go a long way in achieving the corporate's triple bottom line approach. In this study, many social sustainability criteria were identified through the Delphi process and these metrics were also applied in real environments in three different companies. The results were tabulated and shown to the respective purchase managers for sustainable decision making. The AHP model helped the supply chain managers in socially sustainable supplier selection. Relevant and essential social parameters were used to prioritize suppliers in this model. This research addresses the need for social sustainability in business, especially in the supply chain. Though social sustainability parameters in the supply chain are not very prevalent, with this new model, corporates would be able to incorporate them in evaluation and partner selection. Future research should address the following issues:

- What could be the implications of incorporating socially sustainable metrics in business?
- How do we establish a relationship between the social performance and strategic performance of an organization?
- Does a poor social score of a supplier lead to poor business performance?

Unless the purchase managers make up their minds to incorporate social parameters in supply chain, it is very difficult to achieve overall social sustainability in society.

References

- [1]. Amindoust A, Ahmed S, Saghafinia A, Bahreininejad A. Sustainable supplier selection: A ranking model based on fuzzy inference system. *Applied Soft Computing* 2012; 126:1668-1677.
- [2]. Andersen M, Skjoett-Larsen T. Corporate social responsibility in global supply chains. *Supply Chain Management: An International Journal* 2009; 142:75-86.

sustainability. The next step is to record the social performance score of each supplier in the corporate database which should be available to purchase managers of all divisions in the company. All the suppliers should be periodically evaluated and measured based on these parameters and given a performance rating card. For example BHEL in India rates its suppliers on social performance with certain parameters periodically and the suppliers are graded accordingly. However, they do not use all the social performance metrics while grading the supplier (Source: www.bhel.com). The AHP system could also be used to identify and expose poor social performers in the system and help the corporation develop sustainable suppliers in the future.

- [3]. Apple supplier responsibility progress report. Retrieved from https://www.apple.com/supplier-responsibility/pdf/Apple_SR_2014_Progress_Report.pdf; 2014 [Accessed on 23/07/2014].
- [4]. Ashby A, Leat M, Hudson-Smith M. Making connections: a review of supply chain management and sustainability literature. *Supply Chain Management: An International Journal* 2012; 175: 497-516.
- [5]. Bai C, Sarkis J. Green supplier development: Analytical evaluation using rough set theory. *Journal of Cleaner Production* 2010; 1812: 1200-1210.
- [6]. Bai C, Sarkis J. Integrating sustainability into supplier selection with grey system and rough set methodologies. *International Journal of Production Economics* 2010; 1241: 252-264
- [7]. Bansal P. Evolving sustainably: a longitudinal study of corporate sustainable development. *Strategic management journal* 2005; 263:197-218.
- [8]. Basiago AD. Economic, social, and environmental sustainability in development theory and urban planning practice. *Environmentalist* 1998; 192:145-161.
- [9]. Bayazit O. Use of AHP in decision-making for flexible manufacturing systems. *Journal of Manufacturing Technology Management* 2005; 167:808-819.
- [10]. Boone C, Modarres A. *City and environment*. Temple University Press; 2009.
- [11]. Bramley G, Power S. Urban form and social sustainability: the role of density and housing type. *Environment and planning, B, Planning & design* 2009; 361: 30.
- [12]. Bruntland G. Our common future: The world commission on environment and development; 1987.
- [13]. Büyüközkan G, & Çifçi G. A novel fuzzy multi-criteria decision framework for sustainable supplier selection with incomplete information. *Computers in Industry* 2011; 622:164-174.

- [14]. Campbell JL. Why would corporations behave in socially responsible ways? An institutional theory of corporate social responsibility. *Academy of management Review* 2007; 323: 946-967.
- [15]. Carter CR. Purchasing social responsibility and firm performance: the key mediating roles of organizational learning and supplier performance. *International Journal of Physical Distribution & Logistics Management* 2005; 353: 177-194.
- [16]. Carter CR, Easton PL. Sustainable supply chain management: evolution and future directions. *International Journal of Physical Distribution & Logistics Management* 2011; 411: 46-62.
- [17]. Carter CR, Jennings MM. Logistics social responsibility: an integrative framework. *Journal of business logistics* 2002a; 231:145-180.
- [18]. Carter CR, Jennings MM. Social responsibility and supply chain relationships. *Transportation Research Part E: Logistics and Transportation Review* 2002b; 381:37-52.
- [19]. Carter CR, Jennings MM. The role of purchasing in corporate social responsibility: a structural equation analysis. *Journal of business Logistics* 2004; 251:145-186.
- [20]. Carter CR, Rogers DS. A framework of sustainable supply chain management: moving toward new theory. *International journal of physical distribution & logistics management* 2008; 385: 360-387.
- [21]. Carter CR, Auskalmis R, and Ketchum C. Purchasing from minority business Enterprises:a cross-industry comparison of best practices. *Journal of Supply Chain Management* 1999; 351: 28-32.
- [22]. CBS News report. Shrimp sold at Walmart Costco tied to slave labour. Retrieved from <http://www.cbsnews.com/news/shrimp-sold-at-walmart-costco-tied-to-slave-labor/>; 2014 (accessed on 6th June, 2014).
- [23]. Chatterjee P, Finger M. *The earth brokers: Power, politics, and world development*. US: Taylor & Francis; 1994.
- [24]. Ciliberti F, Pontrandolfo P, Scozzi B. Logistics social responsibility: standard adoption and practices in Italian companies. *International Journal of Production Economics* 2008; 1131:88-106.
- [25]. Clarkson ME. A stakeholder framework for analyzing and evaluating corporate social performance. *Academy of management review* 1995; 201:92-117.
- [26]. Colantonio A. Social sustainability: An exploratory analysis of its definition, assessment methods metrics and tools; 2007a
- [27]. Colantonio A. Social Sustainability: An exploratory analysis of its definition, assessment methods, metrics and tools. In: *Measuring Social Sustainability: Best Practice from Urban Renewal in the EU 2007/01: EIBURS Working Paper Series*. Oxford Institute for Sustainable Development (OISD), International Land Markets Group, Oxford Brookes University. UK: Oxford; 2007b
- [28]. Crabtree L. Sustainability begins at home? An ecological exploration of sub/urban Australian community-focused housing initiatives. *Geoforum* 2006; 374:519-535.
- [29]. Dickson GW. An analysis of vendor selection systems and decisions. *Journal of purchasing* 1966; 21: 5-17.
- [30]. Dowlatshahi S. Designer–buyer–supplier interface: Theory versus practice. *International Journal of Production Economics* 2000; 632:111-130.
- [31]. Drumwright ME. Socially responsible organizational buying: environmental concern as a noneconomic buying criterion. *The Journal of Marketing* 1994; 1-19.
- [32]. Dyllick T, Hockerts K. Beyond the business case for corporate sustainability. *Business strategy and the environment* 2002; 112:130-141.
- [33]. Ehr Gott M, Reimann F, Kaufmann L, Carter CR. Social sustainability in selecting emerging economy suppliers. *Journal of Business Ethics* 2011; 981: 99-119.
- [34]. Elkin T, McLaren D, Hillman M. *Reviving the City. London Friends of the Earth; 1991.*
- [35]. Elkington J. Partnerships from cannibals with forks: The triple bottom line of 21st-century business. *Environmental Quality Management* 1998; 81:37-51.
- [36]. Emmelhainz MA, Adams RJ. The apparel industry response to “sweatshop” concerns: a review and analysis of codes of conduct. *Journal of Supply Chain Management* 1999; 352: 51-57.
- [37]. Enarsson L. Evaluation of suppliers: How to consider the environment. *International Journal of Physical Distribution and Logistics Management* 1998; 281:5–17.
- [38]. Evans B, Joas M, Sundback S, Theobald K. Governing local sustainability. *Journal of environmental planning and management* 2006; 496: 849-867.
- [39]. Foladori G. Advances and limits of social sustainability as an evolving concept. *Canadian Journal of Development Studies – Revue Canadienne DEtudes Du Developpement* 2005; 263: 501–510.
- [40]. Freeman RE. The stakeholder approach revisited. *Zeitschrift für Wirtschafts-und Unternehmensethik* 2004; 53:228-241.
- [41]. Freeman RE. *Strategic Management: A Stakeholder Approach.*

- NJ. Prentice-Hall, Englewood Cliffs; 1984
- [42]. Gereffi G, Korzeniewicz M. (Eds.). *Commodity Chains and Global Capitalism* (No. 149). ABC-CLIO;1994
- [43]. Gladwin TN, Krause TS, Kennelly JJ. Beyond eco-efficiency: Towards socially sustainable business. *Sustainable Development* 1995; 31:35-43.
- [44]. Godschalk DR. Land use planning challenges: Coping with conflicts in visions of sustainable development and livable communities. *Journal of the American Planning Association* 2004; 70(1): 5-13.
- [45]. Gopalakrishnan K, Yusuf YY, Musa A, Abubakar T, Ambursa HM. Sustainable supply chain management: A case study of British Aerospace (BAe) Systems. *International Journal of Production Economics* 2012; 140(1):193-203.
- [46]. Goworek H. Social and environmental sustainability in the clothing industry: a case study of a fair trade retailer. *Social Responsibility Journal* 2011; 7(1):74-86.
- [47]. Gupta AD. Social responsibility in India towards global compact approach. *International Journal of Social Economics* 2007; 34(9):637-663.
- [48]. Halme M, Jasch C, Scharp M. Sustainable homeservices? Toward household services that enhance ecological, social and economic sustainability? *Ecological Economics* 2004; 51(1): 125–138.
- [49]. Handfield R, Walton SV, Sroufe R, Melnyk SA. Applying environmental criteria to supplier assessment: A study in the application of the Analytical Hierarchy Process. *European Journal of Operational Research* 2002; 141(1): 70-87.
- [50]. Hens L, Nath B. *The world summit on sustainable development*. Dordrecht: Springer; 2005.
- [51]. Hopkins M. *The Planetary Bargain. Corporate Social Responsibility Comes of Age*. London: Macmillan; 1999
- [52]. Hsu CW, Hu AH. Applying hazardous substance management to supplier selection using analytic network process. *Journal of Cleaner Production* 2009; 17(2):255–264.
- [53]. Huang SH, Keskar H. Comprehensive and configurable metrics for supplier selection. *International Journal of Production Economics* 2007; 105(2): 510-523.
- [54]. Humphreys PK, McIvor R, Chan FTS. Using case based reasoning to evaluate supplier environmental management performance. *Expert Systems with Applications* 2003b; 25(2): 141–153.
- [55]. Humphreys PK, Wong YK, Chen FTS. Integrating environmental criteria into the supplier selection process. *Journal of Materials Processing Technology* 2003a; 138(1): 349–356.
- [56]. Hutchins MJ, Sutherland JW. An exploration of measures of social sustainability and their application to supply chain decisions. *Journal of Cleaner Production* 2008; 16(15):1688-1698.
- [57]. Jenkins R. Corporate Codes of Conduct. Self-Regulation in a Global Economy, *United Nations Research Institute for Social Development*, Geneva; 2001.
- [58]. Källström HN, Ljung M. Social sustainability and collaborative learning. *AMBIO: A Journal of the Human Environment* 2005; 34(4): 376-382.
- [59]. Knoepfel I. Dow Jones Sustainability Group Index: a global benchmark for corporate sustainability. *Corporate Environmental Strategy* 2001; 8(1):6-15.
- [60]. Kogg B, Mont O. Environmental and social responsibility in supply chains: The practise of choice and inter-organisational management. *Ecological Economics* 2012; 83:154-163.
- [61]. Kortelainen M. Dynamic environmental performance analysis: a Malmquist index approach. *Ecological Economics* 2008; 64(4):701-715.
- [62]. Krause DR, Handfield RB, Tyler BB. The relationships between supplier development, commitment, social capital accumulation and performance improvement. *Journal of operations management* 2007; 25(2):528-545.
- [63]. Krause DR, Vachon S, Klassen RD. SPECIAL TOPIC FORUM ON SUSTAINABLE SUPPLY CHAIN MANAGEMENT: INTRODUCTION AND REFLECTIONS ON THE ROLE OF PURCHASING MANAGEMENT. *Journal of Supply Chain Management* 2009; 45(4):18-25.
- [64]. Labuschagne C, Brent AC, van Erck RPG. Assessing the sustainability performances of industries. *J Clean Prod* 2005; 13(3):73–85.
- [65]. Labuschagne, C. *Sustainable project life cycle management: criteria for the South African process industry*; 2010.
- [66]. Lafferty WM, Langhelle O. (Eds.). *Towards sustainable development: on the goals of development-and the conditions of sustainability*. Macmillan; 1999
- [67]. Leire C, Mont O. The implementation of socially responsible purchasing. *Corporate Social Responsibility and Environmental Management* 2010; 17(1):27-39.
- [68]. Lu RX, Lee PK, Cheng TCE. Socially responsible supplier development: Construct development and measurement validation. *International Journal of Production Economics* 2012; 140(1): 160-167.
- [69]. Maignan I, Hillebrand B, McAlister D. Managing socially responsible buying: how to integrate non-economic criteria

- into the purchasing process, *European Management Journal* 2002; 20: 641-648.
- [70]. Malhotra MK, Steele DC, Grover V. Important strategic and tactical manufacturing issues in the 1990s. *Decision Sciences* 1994; 252:189–214.
- [71]. Maloni MJ, Brown ME. Corporate social responsibility in the supply chain: an application in the food industry. *Journal of business ethics* 2006; 681: 35-52.
- [72]. McWilliams A, Siegel D. Corporate social responsibility: A theory of the firm perspective. *Academy of management review* 2001; 261:117-127.
- [73]. Mitlin D, Satterthwaite D. Chapter One Sustainable Development and Cities. *Sustainability: The Environment and Urbanization*; 1996.
- [74]. Ministry of labour annual report. Retrieved from <http://labour.gov.in/upload/uploadfiles/files/Reports/annualreport.pdf> ; 2013 (accessed on 2nd October, 2014)
- [75]. Murphy PR, Poist RF. Socially responsible logistics: an exploratory study. *Transportation Journal* 2002; 23-35.
- [76]. Nahapiet J, Ghoshal S. Social capital, intellectual capital, and the organizational advantage. *Academy of management review* 1998; 232:242-266.
- [77]. Omann I, Spangenberg JH. Assessing social sustainability. In *BIENNIAL CONFERENCE OF THE INTERNATIONAL SOCIETY FOR ECOLOGICAL ECONOMICS* 2002; 71
- [78]. Pagell M, Wu Z. Building a more complete theory of sustainable supply chain management using case studies of 10 exemplars. *Journal of supply chain management* 2009; 452: 37-56.
- [79]. Pearce DW, Markandya A, Barbier E. *Blueprint for a green economy*. Earthscan 1989 ; 1
- [80]. Poist RF. Evolution of conceptual approaches to the design of logistics systems: a sequel. *Transportation Journal* 1989; 283: 35-39.
- [81]. Polèse M, Stren RE. *The social sustainability of cities: Diversity and the management of change*. University of Toronto Press; 2000.
- [82]. Redclift M. Sustainable development (1987–2005): an oxymoron comes of age. *Sustainable development* 2005, 134: 212-227.
- [83]. Roth AV, Tsay AA, Pullman ME, Gray JV. Unraveling the food supply chain: strategic insights from China and the 2007 recalls. *Journal of Supply Chain Management: A Global Review of Purchasing and Supply* 2008; 441:22–39.
- [84]. Saaty TL. A scaling method for priorities in hierarchical structures. *Journal of mathematical psychology* 1977; 153: 234-281.
- [85]. Sachs I. Social sustainability and whole development: exploring the dimensions of sustainable development. *Sustainability and the social sciences: a cross-disciplinary approach to integrating environmental considerations into theoretical reorientation* 1999; 25-36.
- [86]. Schaefer A. “Corporate sustainability –integrating environmental and social concerns?”, *Corporate Social Responsibility and Environmental Management* 2004; 11:179-187.
- [87]. SCHLOSSBERG M, ZIMMERMAN A. Developing statewide indices of environmental, economic, and social sustainability: a look at Oregon and the Oregon Benchmarks. *Local Environment* 2003; 86: 641-660.
- [88]. Sen S, Bhattacharya CB. Does doing good always lead to doing better? Consumer reactions to corporate social responsibility. *Journal of marketing Research* 2001; 225-243.
- [89]. Seuring S, Müller M. Core issues in sustainable supply chain management—a Delphi study. *Business Strategy and the Environment* 2008a; 178: 455-466.
- [90]. Seuring S, Müller M. From a literature review to a conceptual framework for sustainable supply chain management. *Journal of cleaner production* 2008b; 1615:1699-1710.
- [91]. Sharma S, Ruud A. On the path to sustainability: integrating social dimensions into the research and practice of environmental management. *Business Strategy and the Environment* 2003; 124:205-214.
- [92]. Spangenberg JH, Omann I. Assessing social sustainability: social sustainability and its multicriteria assessment in a sustainability scenario for Germany. *International Journal of Innovation and Sustainable Development* 2006; 14: 318-348.
- [93]. Spangenberg JH, Omann I, Hinterberger F. Sustainable growth criteria: Minimum benchmarks and scenarios for employment and the environment. *Ecological Economics* 2002; 423:429-443.
- [94]. Stieb JA. Assessing Freeman’s Stakeholder Theory, *Journal of Business Ethics* 2009; 87: 401–414.
- [95]. Strong C. The problems of translating fair trade principles into consumer purchase behaviour. *Marketing Intelligence & Planning* 1997; 151: 32-37.
- [96]. UNCSO - United Nations Commission on Sustainable Development. Measuring Changes in Consumption and Production Patterns. Division for Sustainable Development, Department of Economic and Social Affairs, New York; 1998.
- [97]. UNDSO. Indicators of sustainable development: guidelines and methodologies, <http://www.un.org/esa/sustdev>;

2001. [accessed 15.10.05]
- [98]. United Nations. The Rio Declaration and Agenda 21. New York, NY; 1992.
- [99]. Vachon S, Mao Z. Linking supply chain strength to sustainable development: a country-level analysis. *Journal of Cleaner Production* 2008; 1615:1552-1560.
- [100]. Vallance S, Perkins HC, Dixon JE. What is social sustainability? A clarification of concepts. *Geoforum* 2011; 423:342-348.
- [101]. Wackernagel M. Shortcomings of the Environmental Sustainability Index, <http://www.anti-lomborg.com/ESI%20critique.rtf>; 2001 [download 01.31.2005].
- [102]. Waddock S, Bodwell C. Managing responsibility: what can be learned from the quality movement?. *California Management Review* 2004; 471: 25-37.
- [103]. Weber CA, Current JR, Benton WC. Vendor selection criteria and methods. *European journal of operational research* 1991; 501:2-18.
- [104]. Welford R. Corporate Social Responsibility in Europe, North America and Asia. *Journal of Corporate Citizenship* 2005; 17:33-52.
- [105]. Whooley N. Social Responsibility in Europe. Retrieved from www.pwc.com/extweb/newcolth.nsf/0/503508DDA107A61885256F35005C1E35S; 2004 (accessed 20 August, 2010).
- [106]. Wood DJ. Corporate social performance revisited. *Academy of management review* 1991; 164:691-718.
- [107]. World Bank report. The more things change: The World Bank, TATA and enduring abuses on India's tea plantations. Retrieved from https://web.law.columbia.edu/sites/default/files/microsites/human-rights-institute/files/tea_report_final_draft-smallpdf.pdf; 2014 [accessed on 5/7/2014].
- [108]. Yakovleva N. Measuring the sustainability of the food supply chain: a case study of the UK. *Journal of Environmental Policy & Planning* 2007; 91:75-100.
- [109]. Yakovleva N, Sarkis J, Sloan T. Sustainable benchmarking of supply chains: the case of the food industry. *International Journal of Production Research* 2012; 505:1297-1317.