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Environmental Concerns of Supply Chain Sustainability (SCS)

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Abstract. Environment concern is one important aspect for supply chain sustainability (SCS). Nowadays, company's activities give a lot of impact on the environment. Through these activities, there are other SCS issue of environment were identified. In this paper, the proposed SCS issue of environmental concern will be determined from Corporate Sustainability Report (CSR). Using a total weightage of 0.333 (after dividing into three aspects of sustainability), each proposed issues will be classified according to the company activities in order to determined weightage for each issue. Those weightages then will be used in developing of score metric for SCS in design phase. Result shows that the carbon footprint is the major concern for SCS of environment while environmental management system is a lowest concern for SCS environment.

INTRODUCTION

The issue of sustainability was arising globally since more than two decades. Most company took related issues of sustainability as an important concern as the impact can improve the performances. With modern technology providing various technique in the aspect of technical, management, finance and others, it need to identified any issue that can be interrupt the optimum performances. This can be reached by optimizing the issues of environment, social and economic in the supply chain flow. In this case, the aspect of ecology is a major impact for most company around the world. This was evident through the various strategies the company employs to tackle those issues.

Based on previous publication, these issues were identified in the supply chain process. These issues vary from time by time as the contributions by industry and academic identify new issues that may affect the company performance involving cost, time and the quality of the product or service. The corporate sustainability responsibility report (CSR) release by companies around the world annually, sustainability issues was discussed in depth. Unfortunately, those issues have different priorities depending on the type of business, location, country, policies and stakeholders.

Supply chain provides a systematic process starting from supplier until customer and each stage need to consider the sustainability issue. For example, a fuzzy multi criteria approach was used to examine the problem of identifying triple bottom line for supplier's selection operation in supply chain (1). Using the CSR report release by 31 chosen companies for 2013/2014 session, the issues of sustainability for environmental can be identified

followed by their priorities. The sequences of those issues can finally be concluded following the weightage for the use in developing of new score metrics for supply chain sustainability (SCS) in design phase.

CORPORATE SUSTAINABILITY REPORT (CSR) OVERVIEW

CSR is a document release by most international companies annually which contains information about the environmental, social, economic and governance performance. The information of all those aspects includes the data collected along the period year especially about the stakeholder and sustainable development by the companies. There are five criteria used for assessment using CSR which are inclusivity, discourse, control, transparency and supply chain provide a good basis for the further development of social and environment standards to improve their legitimacy(2).

Consumer is part of supply chain and most likely target for any marketing strategy of company. Indeed, the consumer implication on the issue of sustainability is high. CSR become a medium option for the consumers to understand company policies and positively influence consumer response to a product and service (3). Thus, the information of environmental in CSR becomes one of the factors by consumer to decide their view for the company's policies. Table 1 shows a list of CSR downloaded from company's website.

Using the CSR listed in Table 1, the data of environment extracted by identified any information that relates into the proposed issue. Companies mostly have their right to inform their policies and strategies especially for the environmental issues. Even though, there are no standard structures CSR for companies. From there, the companies can provide any data of environment either in the specific empirical or short data. Because of that, a total of CSR from different type of company is adequate countable value to find a best weightage for proposed environmental issues.

TABLE 1. list of companies and CSR report

No	Company	Document Name
1	Adidas Group	Sustainability Progress Report 2014 (Performance Counts)
2	Apple	Supplier Responsibility 2014 Progress Report
3	Arcelor Mittal	2014 Sustainability Report
4	BASF	BASF Report 2014(Economic, Environment and Social Performance)
5	BP	Sustainability Report 2014
6	Casio	Casio Sustainability Report 2014
7	Coca Cola	2013/2014 Sustainability Report
8	Epson Group	Sustainability Report 2014
9	Ford	Sustainability Report 2013/2014
10	Foxconn	2014 Social and Environmental Responsibility Report
11	Fujitsu Group	CSR Report 2014
12	Honda	Honda Sustainability Report 2014
13	IKEA Group	Sustainability Report FY14
14	LG	2013-2014 LG Electronics Sustainability Report
15	Logitech	Sustainability Report 2014
16	Nestle	Nestle in Society (Creating shared value and meeting our commitments 2014)
17	P & G	2014 Sustainability Report
18	Panasonic Corporation	Sustainability Report 2014
19	PepsiCo	Sustainability Report 2014
20	Petronas	Sustainability Report 2014
21	Samsung	Sustainability Report 2014
22	Shell	Sustainability Report 2014
23	Sime Darby Plantation	Sustainability Report 2014
24	Smurfit Kappa	Sustainable Development Report 2014
25	Sony	CSR Reporting 2014
26	Steelcase	2014 Corporate Sustainability Report
27	Suncor	Report on Sustainability (Summary Report 2014)
28	TATA Group	Corporate Sustainability Report 2013-14
29	Toyota Motor Co	Sustainability Report 2014
30	Vale	Vale 2014 Sustainability Report
31	Volkswagen	Sustainability Report 2014

SUPPLY CHAIN SUSTAINABILITY (SCS) ISSUES

Supply chain sustainability (SCS) or sustainable supply chain management (SSCM) defined as the creation of coordinated supply chains through the voluntary integration of economic, environmental and social considerations with key inter-organizational business systems designed to efficiently and effectively manage the material, information, and capital flows associated with the procurement, production and distribution of products or services in order to meet stakeholder requirements and improve the profitability, competitiveness and resilience of the organization over the short- and long- term (4).

Supply chain sustainability is term used for sustainability issue for supply chain process. Companies nowadays believe a good supply chain flow should give positive impact on the company overall performances. Sustainability issue for such stage including supplier, manufacturer, retailer, customer and product end-of-life may categorize as the SCS. Using the current literatures of SSCM, there are four broad categorized including strategic consideration, decisions at functional interfaces, regulation and government policies, and integrative models and decision support tools (5).

Figure 1 show a proposed issue of sustainability from three classified aspects of sustainability: environment, social and economic.

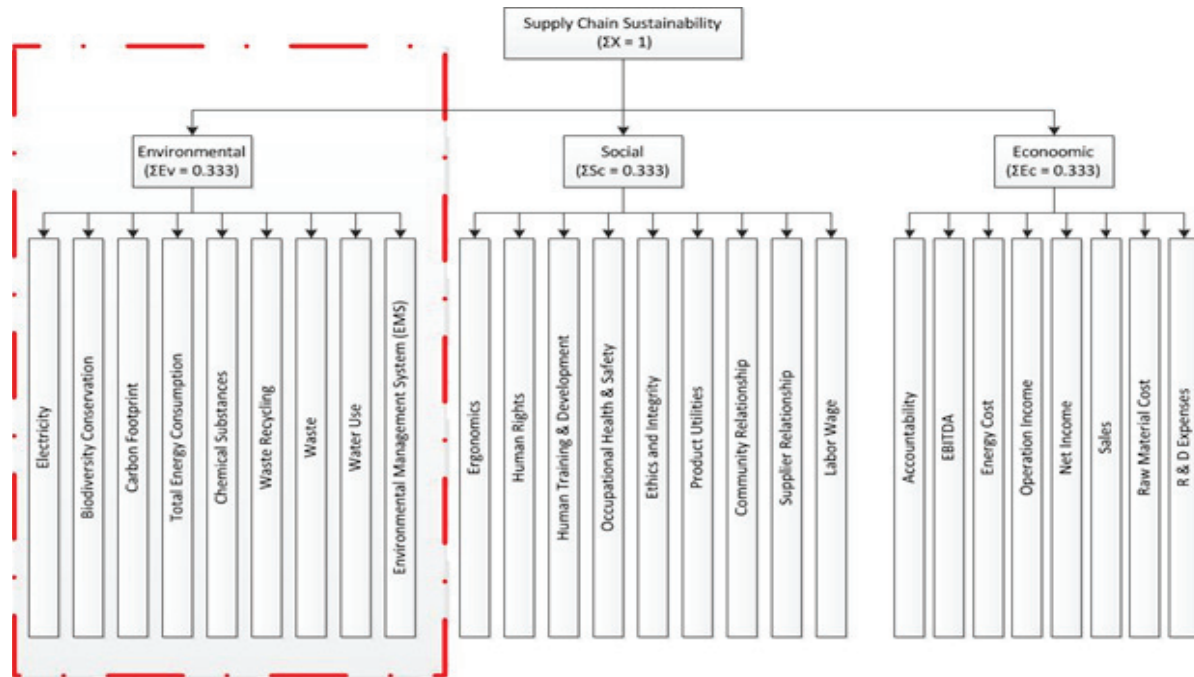


FIGURE 1. The sustainability issue of 3 pillars of sustainability

A broad concern is now emerged on the environmental sustainability supply chain that gives implication not only for present time but also in the future. Industries especially with a good flow of supply chain must intent to put environmental issue as a priority. In addition, this aspect is still continuously studied by academicians and practitioners around the world so that it can be improved in the future.

Through the data from the CSR, authors decide to propose some issues of environmental that become the major priorities for most current companies. Most organization currently more focuses on environmental issues using strategies which may include technological and organizational development projects, as possible alternatives for gaining or maintaining a competitive advantage. Joseph Sarkis (2003) has developed the decision framework based on literature for managerial decision making on evaluating the alternatives environmentally conscious business practices.

Electricity is one of the energy used for all companies around the world. Electricity is important to supply energy to any facilities used in industries. When faced with competitor, they should focus on the use of technology such as latest machine that are usually based on electrical energy. Besides, the total energy consumption also become a SCS for environmental. Total energy consumption is the total energy used by companies involving the energy used by sites, employee, used in logistic and during product use.

Biodiversity Conservation is connection or contraction between various organisms in the earth. Following the increasing 10 billion people with high unemployment and poverty, world is confronted with existential sustainability challenges such as climate change, resource, food and water scarcity, biodiversity losses and

continuing growth of the world's population (6). This involves the ecosystems that need to maintain to ensure the extinction can be prevented. As the earth contain various species of living things, it become important for existing and new industries to ensure this issue is given due consideration. Carbon footprint or greenhouse gas emission is the issue that giving impact on the environment causes by any activity producing of carbon dioxide. While green supply chain management has become popular, fewer studies have been published on carbon footprint in supply chain management (7). With the industries especially involve in the stages of production and transportation, it might give a lot of impact on the environmental such as global warming.

Companies nowadays should consider minimizing the waste they produced. Choy et al. (2011) proposed a re-classification of the 6R (reduce, recover, redesign, reuse, recycle, remanufacturing) methodology for rectifying waste minimization along a supply chain, to increase product utilization at the post-use stage (8). Waste in this case includes the waste of production and waste cause by product end-of-life. In the other hand, they should think how to minimize the impact on the environment by some relevant strategies such as recycling. Waste recycling is the method that supposed to implement by huge industries around the world. This method can be use to minimize the raw material cost besides to improve the process of product lifecycle management cycle by alternative cycle for end-of-life.

While waste become the issue that might impact on the environment, the chemicals substances that produced by the industries related on the production process also could give negative effect especially for the drainage system. The important of this issue rising in European as example Limonta, one of the most important suppliers for Moncler Group, adopted even more stringent requirements for some chemical substances. This supplier of special fabrics for clothing, leather goods, and foot wear was one of the few European products with in-house production lines for coating, flocking, resin impregnation and coagulation, as well as a wide range of textile finishing processes. Limonta demanded the complete elimination of some substances such as lead, cadmium and PCP by its suppliers (9). As environment become important aspect of sustainability, the chemical substances problem also may cause pollutant by spread out into the air. Companies should have prevention strategies to ensure the manufacturing process will not be harmful.

One of the other important requirements for all companies is the water supply. Water consumption by companies are supply for human need for drinking, flow the waste substances from industries to landfill and for manufacturing purposes. Due to obvious need for the water, there is a need to ensure the amount is optimized. This can help to minimize cost for production and human need. As it is become valuable resource, some companies are put this element as their priorities by reduce the amount from the previous year.

Lastly, the Environmental Management System or EMS is the management or an organization of environmental program in systematic and comprehensive to implement the environmental protection. This system is used based on the standard of ISO 14001. Alternatively, this system was includes Eco-Management and Audit Scheme (EMAS) as a voluntary environmental management instrument which was developed by the European Commissions in 1993. Towards this issue, there are looking forward on the registered companies which should base on this system for environmental policies. Environmental Sustainability Index through World Economic Forum's Environmental Sustainability Index was derived 68 indicators and aggregated into 5 components including environmental systems, reducing environmental stresses, reducing human vulnerability, social and institutional capacity and global stewardship. In those elements there are separated into 20 core indicators that are important to be environmental concern (10).

DEVELOPING OF SCS FOR ENVIRONMENTAL WEIGHTAGE

In developing of weightage for supply chain sustainability (SCS), a number of CSRs from different types of international companies were used and analyze on current companies of sustainability issues. This actually the process that is required for developing a score metrics for SCS in design phase. Fig 2 shows the flowchart of overall flow in this research and the current stage for this paper highlighted (11).

In order to measure the issue of sustainability, all the issue are counted following the proposed issues. The data was extracted form CSR based on the company strategies of sustainability. CSR become the best medium for most companies to report the activities involving the sustainability. The structure of CSR is different depends on the company perspective and definition about the sustainability. However, the basic issues are still concentrating on

the three pillars of sustainability that relates on planet, people and profit. By using the CSR, authors need to deal with the limited and variables data provide from each CSR. It is challenging on part of the accuracy because the information given from each report using different type of unit, currency and etc. Because of that, authors decide to identify any proposed issue mentioned from any part in CSR.

FIGURE 2. Project flow of developing the score metrics based on sustainability supply chain in design phase (11)

There are simple criteria for analyzing the CSR. All the sustainability issue that was concern by the companies and mentioned will be taken as company's concern. The CSR information will be analyze through the proposed sustainability issue in the Fig 1. From each CSR, there are companies that are concern about sustainability issue by mentioned the strategy, planning and the impact for those issues.

In developing of SCS weightage from 2013/2014 CSR, the counted issue was calculating using formula given as:

$$\sum_{0 \leq x \leq 1} F[x] = 1 \quad (1)$$

Total

RESULTS

Figure 3 shows the graph of total SCS issues from each company CSR. From the analysis of CSR data, there are five companies have highest concern on environmental SCS with 9 issues involving Casio, Honda, Panasonic, Sony and Toyota. This is different than Vale that has lowest concern with 3 issues of environment.

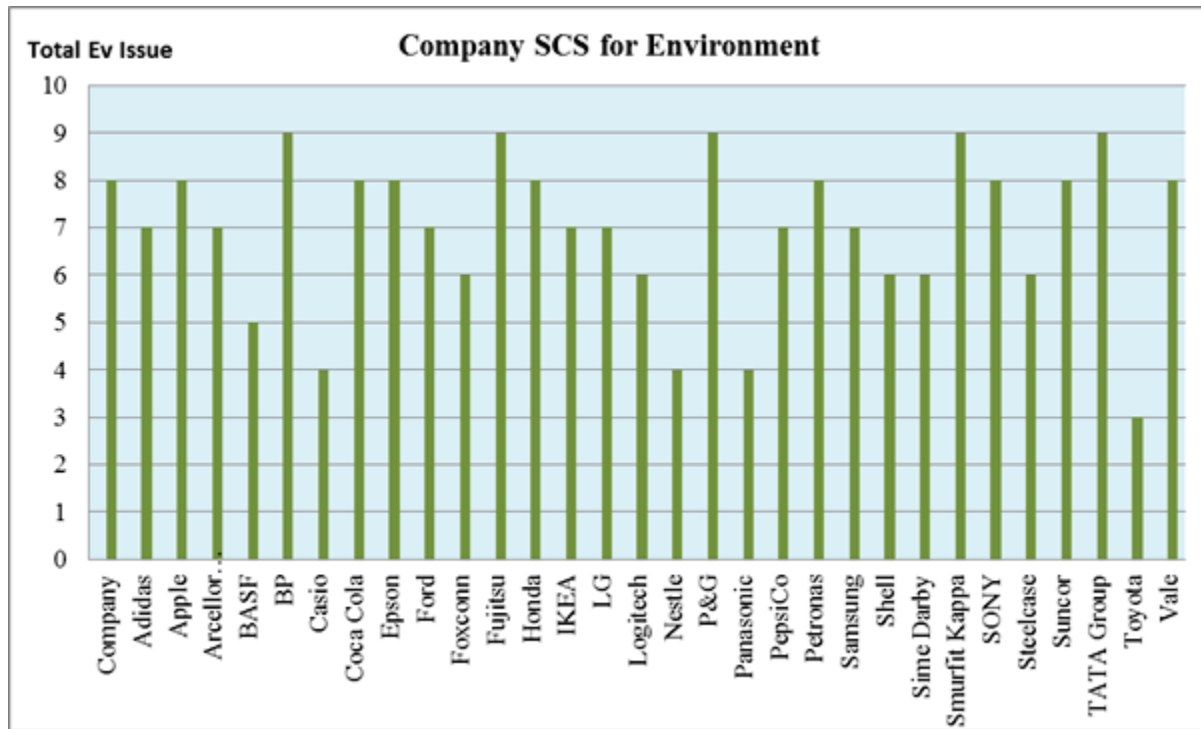


FIGURE 3. A total SCS issue of each company for environment

Through the analysis for environmental SCS, 30 out of 31 companies are concern about the issue of carbon footprint with the weightage 0.03581. It can be look from most of the companies policies which trying to reduce a carbon emission. Panasonic as example was promoted the energy-saving product that they are believed could minimize the contribution on producing the carbon dioxide. Ikea Company in the other hand was identifying the area most contribute on the carbon footprint such as raw materials production, product manufacturing and product use.

This followed by water use in the second place with 0.03461. Apple was one of the companies showed their concern on this issue by launching the clean water program to help reduce water usage, promote water recycling and prevent illegal water pollution within company supply chain. Logitech in their CSR was summarizing the overall water-saving initiatives have contributed to a reduction of 35% in directly withdrawn water consumption since 2010. Waste the third issue that most companies concern with 0.03342. Petronas seek to minimize waste generation at the front-end design and engineering stages by strength then internal processes the areas of waste identification, characterization, handling and disposal.

Issues of total energy consumption have same weightage 0.03342. Shell in 2014 was declare that 1% of improvement in their energy efficiencies across company manufacturing sites is equal to \$5-7 million saving per site, depending on the oil or gas price. Because of that they are recognize how important to identify equipment and processes where they can improve energy efficiency. Steelcase was taking a comprehensive approach to optimizing energy use through reduced consumption and conservation and investments in renewable energy.

With most of companies interest on the closed loop supply chain which are trying to minimize on the use of new raw material, waste recycling become the next concern issues by those companies with 0.02865. P&G has stated in 2014, only 0.4% of all incoming materials were disposed of as waste and all other material either left as finished product or was recycled, reused, repurposed or converted to energy. TATA Group report their performances on the 100% paper waste is recycled, 100% hazardous waste and e-waste are disposed through government authorized recycles, while 14% biodegradable waste recycled on-site.

Besides, the issue of biodiversity conservation has weightage 0.02745 shows the companies also give attention for conservation on the animal and plants. However, this issue is depends on the location and type of business. Example is Sime Darby which involve in the plantation industries with the business location most in Malaysia and Indonesia. Both countries maintain more than 50% forest cover in wildlife reserves adjacent to planted area. They are strictly to follow the standard guidelines on biodiversity conservation by carrying out environmental assessments in their areas of operation. Volkswagen is the company that already started their policy on the biodiversity conservation in 2008. In 2014, they had commissioned 32 reports that analyzed and evaluated emission risks to water, soil and biodiversity at its European production location. To ensure this will be effective, they are promotes the development of practical biodiversity management tools by participating in expert forum and scientific studies.

With development on another option of energy such as biomass and other renewable energy, the electricity become less concern with weightage 0.02387. Casio was mentioned one of initiative that reducing daytime power consumption through the use of geothermal electricity and the installation of power storage equipment as it encounter the business country, Japan faced with such risks as rising electricity tariffs and power shortages in summer and winter. In the other hand, Foxconn company show 5.71% increased of electricity from 2013 to 2014. The growing of this company in the operation is the reason of rising amount of electricity used but in the same time they are actively promotes the Energy Management Contract (EMC) in order to facilitate the growth of the energy services industry and to provide professional energy efficiency services the company and community.

The chemicals substances also just only have the weightage 0.02268 which is also less concern. This issue is depends on the industry types which are involve in producing a chemical substances. BP as petrochemicals company has developed actions intended to manage environmental impacts, including adjusting the use of drilling chemicals to minimize effect on seabed fauna. From 31 companies, the issue of environmental management system has a lowest concern with 0.0179. As this issue is adopted from ISO 14001, some companies are probably attached on the other environmental global standard. Giving like Pepsi Co which are develop their Sustainability Agriculture Policy which supported by their sustainable Farming Initiatives (SFI) that are provides suppliers with resource, training and support to meet their standard.

Table 2 shows the whole result of the weightage for each proposed issue of sustainability based on the CSR. These results are in accord with recent company issue by indicating the environmental has a major concern by most big company around the world by following the sequence of weightages.

TABLE 2. the weightage for each proposed issue of sustainability based on the CSR

Symbol	Sustainability Issues	Weightage
Ev1	Electricity	0.02387
Ev2	Biodiversity Conservation	0.02745
Ev3	Carbon Footprint	0.03581
Ev4	Total Energy Consumption	0.03342
Ev5	Chemical Substances	0.02268
Ev6	Waste Recycling	0.02865
Ev7	Waste	0.03342
Ev8	Water Use	0.03461
Ev9	Environmental Management System (EMS)	0.0179

CONCLUSION

The purpose of current study was to determine the weightages of the SCS issue for environmental using the Corporate Sustainability Report (CSR). This study set out to examine the priorities of proposed SCS issue for environmental from CSR 2013/2014 session using 31 companies around the world which have systematic and proper supply chain flow.

This research has also shown the weightages of the SCS for environmental priorities as shown in Table 2. The following conclusions obtained. 1) Carbon Footprint is the current major concern by those companies. 2) Environmental management System (EMS) is lowest concern by companies because of the various global standards for environment introduced for existing.

The current finding then continues to find weightage of SCS for social and economic and will add to growing body of developing of score metric for supply chain sustainability (SCS) in design phase.

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