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Sustainability Indicators for Evaluating Supply Chain Performance

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Abstract

Sustainability performance in supply chain has been recognized as competitive indicator for business. There are various existing approaches that organizations apply to evaluate their performance on sustainable supply chain management (sSCM). From our previous works, we found that none of existing approaches can solve the criticism of sustainable supply chain performance systems because the complexity of supply chain, complicated analysis methods, and several of involving stakeholders. Hence performance measurement model for evaluating sustainable supply chain should be developed in order to solve the criticism of existing approaches. Because of the complexities and difficulties in sustainability assessment, the sustainability metrics must be clearly defined and assured to satisfy a sustainable development's objectives. This paper proposed metrics to evaluate sustainability in supply chain context.

Key words: sustainability supply chain, performance measurements, sustainability metric

1 Introduction

Measuring sustainability among supply chain has been gaining in popularity for the last two decades. However, criticisms of sustainable supply chain performance measurement systems were made on existing performance measurement approaches such as complicated analysis, implement difficulties, unbalanced between financial and non-financial performance, unrelated with customers or organization's objectives. Existing approaches to evaluate sustainability performance in organization or supply chain are grouped into four groups in our previous work [10] which are:

- 1) Using management system (MS) e.g. ISO MS standards or guidelines, SA8000, Electronic Industry Citizenship Coalition (EICC);
- 2) Using performance measurement system (PMS), which divided into two categories, the first category is *adding sustainability aspect into existing PMS model*, e.g. sustainability balanced scorecard (SBSC), which is proposed by Figge et al (2002) [2][10], GreenSCOR by Supply Chain Council (SCC, 2008). The second category is *developing new sustainability metrics*, e.g. sustainability metrics from Lowell Center for Sustainable Productin

(LCSP);

- 3) Using reporting system e.g. Global Reporting Initiative (GRI);
- 4) Using others approaches such as decision-making tool, e.g. fuzzy multi-criteria model sustainability model by Erol et al. (2011) [2][10].

By using PMS consideration design from Neely et al. (1995) [9],[10] to compare existing approaches, we found that none of existing approaches can solve all of these criticisms. Consequently, four issues to develop future sustainable supply chain performance measurement system are proposed as following ;

- Considering relationship between sustainability performance with organization strategies and objectives;
- Defining leading and lagging indicators for enhancing key success indicators to achieve a long-term sustainable supply chain;
- Including decision-making or mathematical model to integrate and aggregate qualitative indicators (especially in social dimension) leads to more precise for evaluating sustainability performance;
- Focusing on how performance measurement model can evaluate sustainability across organizations in their supply chain.

The goal of our research work is to evaluate sustainability performance in the context of supply chain management. The expected results will show sustainability

performance level of organizations and the consequence will lead to an improving direction for organizations and supply chain who need to increase their competitiveness. The framework to develop sustainability supply chain management (sSCM) performance measurement (PM) model is shown in Fig1. This paper focuses on an analysis to construct the sustainability metrics in term of performance attributes and indicators.

According to Fig1, an exploration of sustainability indicators in the context of supply chain and a comparative study of existing evaluation approaches have been done in our previous work [10]. The objective of this paper is to selecting the methods to construct sSCM performance measurement model based on multi-criteria decision theory. The characteristics of MCDA and a set of preliminary MCDA methods for measuring sustainability in supply chain are proposed. Consequently, the detailed structure of sSCM performance measurement model will be proposed in our future work.

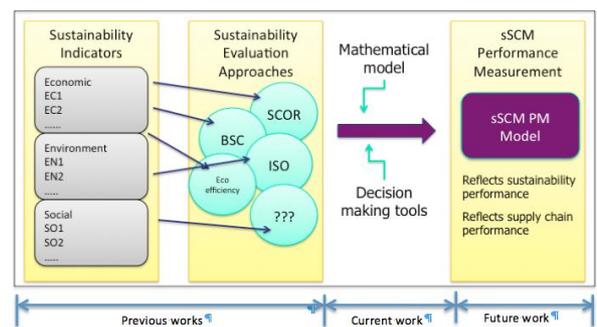


Figure1: Overall research framework

This paper is structured into five main sections. First, the research framework and the summarized of our previous work are introduced. Second, the

literature on concept of sustainable development and sustainable supply chain are presented. After that, the sustainability performance in supply chain is defined. Consequently, we focused on sustainability of electronics industry and the sustainability metrics are proposed. Finally, the future directions to construct sSCM performance measurement model are discussed.

2 Research framework of sSCM performance measurement

The research framework and summarized of previous research works ([10],[11],[12]) are explained in this section. The objectives of research is to develop performance measurement tool for evaluating sustainability performance in the context of supply chain management. The expected results from our research work should answer two main questions; (1) how to measure sustainability performance in the context of supply chain? (2) If we can measure sustainability performance, how companies improve their performance into a higher level?

Because of there are no evaluation model which can be used in all situations. Thus, we are focusing on an evaluation model which can be applied to measure sustainability in Thai electronic industry. Because of this industry has been a major driver of export growth for the country and Thailand is the 13th rank of global exporter in electrical and electronics industry (Global Trade Atlas, 2009). Meanwhile electronics industry has been forced from several international regulations and standards to take into account of

environmental and social impacts. Moreover, The Thai government has supported to increase sustainability in this industry by provided both short-term and long-term projects in sustainability issues.

Although a sustainability measurement through the supply chain is still one of criticism of sSCM performance measurement. But our sSCM evaluation model has not developed to solve this obstacle yet. The border of supply chain perspective in our research framework has been defined as *supply chain orientation* (SCO) perspective, which recognizes on a company who addressed supply chain issues involved relationship management across company into their systemic and strategic implications [7].

In the context of sustainability indicators, we have developed the sustainability aspects based on both sustainable development and supply chain contexts by using SCOR model to define supply chain's activities and selecting sustainability indicators from relevant regulations, standards, guidelines, and academic researches. Sustainability has been categorized regarding to five processes PLAN SOURCE MAKE DELIVER and RETURN. In each process, we grouped the indicators into sustainability aspect. The social aspect (labor and human right, ethic, and society involvement) has been considered in PLAN process because of social metrics relate to more than one process. Moreover, we want to focus a social dimension in term of policy level. After categorized sustainability aspects, we found that material use, and energy and

resource use are basic issues, which located in all processes.

3 Sustainable Development Contexts

3.1 Definition and Objectives

Sustainable development concept is defined in the *Our Common Future* report [1], also known as Brundtland commission or Brundtland report. The definition was defined as *“development that meets the needs of the present without compromising the ability of future generations to meet their needs.”* This definition includes two main features: First that the needs of the present are met, and second, that we must not to make it more difficult for the future generations to meet their needs. Sustainable development is not a fixed state of harmony, but rather a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs.

The term “needs” in the definition is considered into two categories; first, which is essential needs for human being e.g. employment, natural (water, air, soils, and forests) and energy resources for livelihood, sanitation, and health care. Meeting the essential needs requires not only processes to increase productive potential but to ensure equitable opportunities for all.

Second category is the needs to fulfill human aspiration for a better life e.g. living in cleaned natural environment (air, water, soils), education to improve their skills, moral, individual working ability, and community ability, harmony among human beings. The needs for future generations are included, thus

natural and energy resources must be conserved and enhanced in order to meet the needs of future generations. Moreover, the next generations deserve cleaned environmental resources, and well-being living condition. Thus sustainable development is required to prevent environmental pollution, health and environmental impacts, and then shift to non-polluted products/technologies and less-energy or material – usage products/technologies era.

3.2 Guiding principle for sustainable development

The concepts of sustainable development are summarized in terms of human needs’ objectives and guiding principle as shown in Tab1. It is accepted that the interventions needed to achieve sustainable development must be conceived by integration between the three pillars of economic development (income, productivity, innovation technology), social equity (sanitation, health care, human potential capabilities, education, etc.), and environmental protection (natural resources, material, energy). Realizing that all of these are connected and cannot be treated in isolation one from another, for example, an emission from human activities impacts the quality of ecological system and also human health and safety, or education helps to improve skills and knowledge performance, which leads to an increasing of productivity in economic point of view, and also leads to an innovation technology development to shift to less (or non) – polluting products/technologies

in environmental point of view.

In order to implement sustainable development in company and supply chain, the guiding principles in Tab 1 can be used for setting their strategy direction. These principles lead to a sustainable development in both short and long term perspectives as shown in Tab2. Sustainability in short-term perspective is the ability of activities to meet the needs of present and future generations. In the other hand, sustainability in long-term perspective is the ability of activities to shift human activities to non-polluting products/techonologies, less - material and energy- usage era, changing people attitudes, life style and behavior toward sustainable path. Increasing sustainability performance must be considered both short and long term perspectives.

4 Sustainability Performance of Supply Chain

For evaluating sustainability performance of supply chain, it is needed to link the concepts of supply chain and sustainability. The term of “supply chain” consists of multiple firms, both upstream and downstream, and the ultimate consumer and involves with flows of products, materials, information, and finances from a source to a customer [7]. Activities in supply chain concept have to be identified by an engagement level both upstream and downstream. The engagement divided into three levels, which are company level, supply chain level, and stakeholder level.

According to the sustainable

development definition in section 2, we defined the term of “sustainability” in supply chain perspective as *ability to achieve needs of an individual company and its network through the coordination of activities to improve economic performance by conserving and enhancing resources usage efficiency, reducing risk of human health and safety, and improving human capabilities and human well-being*. There are two main features in sustainable supply chain. One is identifying *needs* of company and its network in supply chain and anotherone is enhancing the activities, which reflect both short-term and long-term outcomes for the supply chain.

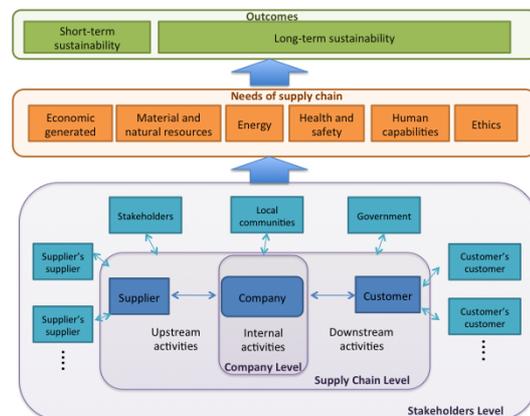


Figure2 The elements of sustainable supply chain

The elements of combining supply chain and sustainability to building a sustainable supply chain (as shown in Fig2) consist of an engagement level among supply chain entities, needs of supply chain, and time frame of outcomes.

5 Constructing Sustainability Metrics in Supply Chain

5.1 Needs of sustainable supply chain

The basic needs of supply chain is to

achieve economic goal (economic generated and distributed for the company and its network). But for the needs of sustainable supply chain, environmental and social impacts are considered. Needs of sustainable supply chain consist of six categories which are economic, material and natural resources, energy, health and safety, human capabilities and ethics.

5.2 Time-frame perspectives of outcomes from sustainable supply chain

In order to implement sustainable development in company and supply chain, the guiding principles in Tab 1 can be used for setting their strategy direction. These principles lead to a sustainable development in both short and long term perspectives as shown in Tab3. Sustainability in short-term perspective is the ability of activities to achieve the supply chain needs interm of improving economic performance, reducing material, natural resources, and energy usage, reducing hazardous substances in material, reducing pollution emission, providing safety work conditions for employee, considering negative impacts to consumer health and safety, increasing working skill and knowledge, increasing employee's moral. In the other hand, sustainability in long-term perspective is the ability of activities to shift human activities to non-polluting products/techonologies, less - material and energy- usage era, changing people attitudes, life style and behavior toward sustainable path.

5.3 Engagement level

This paper divided an engagement level among company and its network into three levels as follow :

- **Company level** considers activities of owned company which does not engage with any external groups or companies.
- **Supply chain level** considers activities under taken to create opportunities for negotiation, consultation or simply exchange of information between or among company and the first-tier supply chain (suppliers, outsourced companies, customers, users or others)
- **Stakeholders level** considers activities under taken to create opportunities for negotiation, consultation or simply exchange of information between or among company and stakeholders. In this work, stakeholder is defined as individual or group that has an interest in any decision or activity of a company including second-tier suppliers, customer's customers, users, and so on.

6 Proposed Sustainability Metrics

Sustainability metrics are proposed regarding to engagement level of company of its supply chain's activities and respect to supply chain needs. A metric is a verifiable measure, stated in either quantitative or qualitative terms and defined with respect to a reference point. Ideally, metrics are consistent with how the operation delivers value to its customers as stated in meaningful terms. The

six sustainability metrics are economic, material and natural resources, energy, health and safety, human capabilities, and ethics, which are shown in Tab4 to Tab9 respectively.

7 Conclusion

The purpose of this paper is to identify sustainability performance attribute in the supply chain management context and construct the sustainability metrics by using the sustainable development concept from Bruntland commission as a framework. Supply chain needs was identified regarding to essential and human aspiration expected from an industrial side. The main criticism of measure sustainability in supply chain is difficulties to evaluate sustainability along whole supply chain is still a challenge for supply chain performance evaluation. Thus, in our research works considered supply chain as a simple supply chain (focusing on focal company and its first tier suppliers and customers). There are three main features to construct sustainability metrics which are (1) supply chain needs identification must covers all of three core dimension, (2) engagement level of activities must covers supply chain level, and (3) metrics should reflect both short-term and long-term outcomes of activities.

Six categories of sustainability metrics are proposed and we found that four of six sustainability metrics can be evaluated in supply chain level which are economic, material and natural resources, energy, and health and safety metrics. But the other two metrics (human capabilities and ethics) can be

evaluated in only company level especially in employee's moral and ethical issues.

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Appendix

Table1: Objective and guiding principle to achieve sustainable development

Human Needs		Objective	Guiding for SD
Essential	Income	<ul style="list-style-type: none"> ● Reduce poverty ● Better income distribution 	<ul style="list-style-type: none"> ● Equitable income distribution
	Natural resources	<ul style="list-style-type: none"> ● Sufficient material, water and land for livelihood ● Reduced vulnerability to natural disasters and technological risks 	<ul style="list-style-type: none"> ● Improving material usage efficiency ● Conserving and efficiently using natural resources. Efficiency can be improved by considered using, recycling, and substitution capability. ● Prevent and reduce air, water, and soils pollution ● Promote less material products and technologies ● Assess potential impacts of new technologies before they are widely used, in order to ensure that their production, use, and disposal do not overstress environmental

Human Needs	Objective	Guiding for SD
	<ul style="list-style-type: none"> • Sufficient energy needs for livelihood 	<p>resources.</p> <ul style="list-style-type: none"> • Conserving and efficiently using energy by reduce energy consumption • Using renewable energy • Assess potential impacts of new technologies before they are widely used, in order to ensure that their production, use, and disposal do not overstress energy sources. • Improvements in energy efficiency and a shift towards less energy-intensive sectors. • Encourage a shift to non-polluting sources and technologies
	<ul style="list-style-type: none"> • Living in a good quality condition (safe and healthy) • Improving health 	<ul style="list-style-type: none"> • Providing primary health care facilities and making sure that everyone has the opportunity to use them are appropriate starting points. • Reduce environmental and development problems which impact on health and well-being • Health care must be supplemented by effective health education • New techniques and technologies for safety design and control, accident prevention, contingency planning, damage mitigation, and provision of relief. • Assess potential impacts of new technologies before they are widely used, in order to ensure that their production, use, and disposal do not negative impacts to human health.
Aspiration Fulfillment	<ul style="list-style-type: none"> • Living in cleaned environment (cleaned air, water, soils) 	<ul style="list-style-type: none"> • Prevent and reduce air, water, and soils pollution. • Assess potential impacts of new technologies before they are widely used, in order to ensure that their production, use, and disposal do not overstress environmental resources.
	<ul style="list-style-type: none"> • Improved individual potential capabilities • Improved community potential capabilities • Improved health, and preservation of cultural heritage 	<ul style="list-style-type: none"> • Encourage in education to improve human skills and knowledge performance • Embed sustainability, equity, social justice, and security in to account regarding to a safe environmentally sound energy as a component of decision making

Human Needs		Objective	Guiding for SD
Harmony among human brings and between humanity and nature	<ul style="list-style-type: none"> Encourage and promote harmony among human brings and between humanity and nature Community knowledge and support, which entails greater public participation in the decisions that affect the environment 	<ul style="list-style-type: none"> Changing in attitudes and objectives and in institutional arrangements at every level to integrate economic and ecological considerations in decision-making. Policy decisions must focus on the source of environmental damage rather than the symptoms. Changing people's values, attitudes, perspectives and life-styles towards environment and development - indeed, towards society and work at home, on farms, and in factories 	

Source: Analysed from Brundtland commission [1]

Table2 Time frame perspective of sustainable development contribution

Human Needs	Short-term	Medium-term	Long-term
Income	<ul style="list-style-type: none"> Proverty reduction 	<ul style="list-style-type: none"> Equitable income distribution for local community 	<ul style="list-style-type: none"> Equitable income distribution for all
Material and natural resources	<ul style="list-style-type: none"> Conserve and enhance the resources base by efficiently using and reduce environmental emission 	<ul style="list-style-type: none"> Assess potential environmental impacts of new technologies before they are widely used 	<ul style="list-style-type: none"> Shift to non-polluting products and technologies era Shift to less-material usage products and technologies
Energy	<ul style="list-style-type: none"> Conserve and enhance energy resources by efficiently using and reduce energy consumption 	<ul style="list-style-type: none"> Assess energy usage impacts of new technologies before they are widely used Substitution of renewable energy 	<ul style="list-style-type: none"> Shift to less-energy usage products and technologies
Sanitation and health care	<ul style="list-style-type: none"> Providing primary health care facilities Reduce environmental and development problems which impact on health and well-being 	<ul style="list-style-type: none"> Assess and reduce potential health impacts of new technologies before they are widely used 	<ul style="list-style-type: none"> New techniques and technologies for safety design and control, accident prevention, contingency planning, damage mitigation, and provision of relief.
Potential capabilities for human well-being	<ul style="list-style-type: none"> Encourage in education to improve human skills and knowledge performance 	<ul style="list-style-type: none"> Embed sustainability, equity, social justice, and security in to account regarding to a safe environmentally sound energy as a component of decision making 	<ul style="list-style-type: none"> Changing people attitudes, life style and behavior toward sustainable path

Table 3 Guiding principles for sustainable supply chain regarding to time frame outcomes

Needs	Short-term	Medium-term	Long-term
Economic value generated and distributed	<ul style="list-style-type: none"> ● Increase revenue growth of company ● Reduce operating cost of company ● Increase company market sharing ● Encourage transparency payment to governance (gross taxes) ● Provide suitable wages and benefits to employee 	<ul style="list-style-type: none"> ● Identify the structure of retirement plans offered to employees are based on benefit plans or other types of benefits. ● Policy or common practices for preferring locally based supplier ● Percentage of the procurement budget that spent on local suppliers. 	<ul style="list-style-type: none"> ● Embed sustainability, equity, social justice, and security in company's strategy
Material and natural resources	<ul style="list-style-type: none"> ● Using raw material efficiently (reduce, reuse, recycle) ● Using natural resources (water, land) efficiently ● Reduce pollution generated by company's activities (air, water, soils, waste) ● Encourage to increase supplier's efficiency of material and resources used ● Encourage to reduce environmental emission by supply chain's activities 	<ul style="list-style-type: none"> ● Assess environmental impacts of new products or technologies before they are widely used i.e. using LCA thinking. ● Merging environmental issue into decision-making process ● Re-design product to increase material used efficiency by mean of collaborating with suppliers and/or customers 	<ul style="list-style-type: none"> ● Implement non-polluting technology i.e. Eco-Design, clean technology in company ● Encourage non-polluting technology implementation in supply chain
Energy	<ul style="list-style-type: none"> ● Using energy efficiently (reduce, reuse, recycle) ● Encourage to increase supplier's efficiency of energy used 	<ul style="list-style-type: none"> ● Substitution of renewable energy ● Assess energy usage impacts of new technologies before they are widely used ● Merging energy usage issue into decision-making process ● Re-design product or process to increase energy efficiency by mean of collaborating with suppliers and/or customers 	<ul style="list-style-type: none"> ● Implement new technologies for less-energy usage products
Health care and Safety	<ul style="list-style-type: none"> ● Providing primary health care facilities for employee ● Providing a safety working 	<ul style="list-style-type: none"> ● Assess and reduce potential health impacts of new technologies before they are 	<ul style="list-style-type: none"> ● Implement new techniques and technologies for safety design and control, and

Needs	Short-term	Medium-term	Long-term
	<p>condition for employee</p> <ul style="list-style-type: none"> ● Providing clean and safe work place for employee ● Reduce environmental and development problems which impact on employee's health and well-being ● Reduce health impacts to customer 	<p>widely used</p> <ul style="list-style-type: none"> ● Merging health impacts issue into decision-making process 	<p>accident prevention.</p>
Human capabilities	<ul style="list-style-type: none"> ● Providing an essential training to increase working skills and knowledge performance for employee ● Increase employee's morality 	<ul style="list-style-type: none"> ● Embed sustainability, equity, social justice, and security in to account regarding to a safe environmentally sound energy as a component of decision making 	<ul style="list-style-type: none"> ● Changing employee/suppliers and stakeholder's attitudes, life style and behavior toward sustainable path

Table 4 Sustainability metrics: Economic

Category	Company level	Supply chain level	Stakeholders level
Economic value generated	<ul style="list-style-type: none"> ● Sales ● Production volumes ● Total income ● Total cost ● Net revenue ● Total expenditure of employee's salary ● Equivalent monetary value of all benefits to employee ● The structure of retirement plans offered to employee ● Personnel costs (wages, salaries, social welfare contributions, pension plan expenses, employee benefits) 	<ul style="list-style-type: none"> ● Equivalent monetary value of cost reduction from activities/projects collaborating with suppliers ● Equivalent monetary value of cost reduction from activities/projects collaborating with customers 	<ul style="list-style-type: none"> ● Taxes paid to all tax-levying authorities ● State subsidies and assistance ● Total number of activities to increase shareholder's earning
Economic value distributed	<ul style="list-style-type: none"> ● Percentage of local employee ● Percentage budget that spent on local suppliers ● Policy or common practices for preferring locally based supplier 	<ul style="list-style-type: none"> ● Percentage of suppliers who include preferring locally based into their strategic policy 	<ul style="list-style-type: none"> ● (None identified)

Category	Company level	Supply chain level	Stakeholders level
	<ul style="list-style-type: none"> Total number of activities for generating income to local community 		

Table 5 Sustainability metrics: Material and natural resources

Category	Company level	Supply chain level	Stakeholders level
Material conservation	<ul style="list-style-type: none"> Total material consumption Percentage of material consumption reduction Percentage of recycled and/or reused material Percentage of recyclable and/or reuseable material Equivalent monetary value of cost saving from material conservation activities Total number or equivalent monetary value of re-design products/processes to reduce material consumption 	<ul style="list-style-type: none"> Percentage of suppliers who commit to increase material consumption efficiency Equivalent monetary value of material consumption reduction from activities/projects collaborating with suppliers Equivalent monetary value of material consumption reduction from activities/projects collaborating with customers Percentage of customers who the company commit to increase material consumption efficiency 	<ul style="list-style-type: none"> Total number of products/product families which participate in to take-back program
Hazardous substances/material	<ul style="list-style-type: none"> Percentage of hazardous material Percentage of hazardous substances reduction Percentage of suppliers which meet hazardous substances criteria Percentage of non-compliance incoming material in hazardous issues Percentage of products which provide hazardous information to customers Total number of non-compliance issues relating to hazardous substances 	<ul style="list-style-type: none"> Percentage of suppliers who completed hazardous substances information Total number of practices/projects collaborating with suppliers for reducing hazardous substances Total number of practices/projects collaborating with customers for reducing hazardous substances 	<ul style="list-style-type: none"> Total expenditure to communicate with stakeholders on hazardous substances issue

	issue from customers		
Resources conservation	<ul style="list-style-type: none"> Water consumption Percentage of recycled water Percentage of water used reduction Percentage of complement or replace non-renewable resources with alternative renewable and low impact sources 	<ul style="list-style-type: none"> Total number of practices/projects collaborating with suppliers for conserving water resources Total number of practices/projects collaborating with customers for conserving water resources 	<ul style="list-style-type: none"> Total expenditure in social activities to promote sustainable consumption.
Environmental prevention	<ul style="list-style-type: none"> CO₂ emissions GHG emissions Water emissions Significant quantities of spilled chemicals, oils, and fuels Total quantities of solid waste Percentage of waste recycling Fines and sanctions for non-compliance with applicable international declarations, conventions, and treaties, as well as with national, regional, and local regulations relating to environmental issues Cost saving from implementing clean technology Ratio of products/product family using LCA thinking to assess environmental impacts before they are widely used Percentage of suppliers who meet environmental criteria 	<ul style="list-style-type: none"> Total number of practices/projects collaborating with suppliers to reduce environmental emissions Total number of practices/projects collaborating with customers to reduce environmental emissions Ratio of products/product family using Eco-design by collaborating with suppliers and customers 	<ul style="list-style-type: none"> Total expenditure in social activities for valuing, protecting, and restoring ecosystems

Table 6 Sustainability metrics: Energy

Category	Company level	Supply chain level	Stakeholders level
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Category	Company level	Supply chain level	Stakeholders level
Energy conservation	<ul style="list-style-type: none"> • Total energy consumption • Total fuels consumption • Percentage of energy consumption reduction • Percentage of fuels consumption reduction • Cost saving from implementing low energy or renewable energy in company • Total number of activities/projects which assessing energy usage impacts of new technologies before they are widely used 	<ul style="list-style-type: none"> • Percentage of suppliers who commit to increase energy consumption efficiency • Percentage of re-designed product or process to increase energy efficiency by mean of collaborating with suppliers and/or customers • Equivalent monetary value of energy consumption reduction from activities/projects collaborating with suppliers • Equivalent monetary value of energy consumption reduction from activities/projects collaborating with customers • Percentage of customers who the company commit to increase energy consumption efficiency 	<ul style="list-style-type: none"> • Total number of products/product families which participate in to take-back program
Renewable energy	<ul style="list-style-type: none"> • Percentage of alternative renewable energy implementation 	<ul style="list-style-type: none"> • Equivalent monetary value of energy consumption reduction from activities/projects collaborating with suppliers • Equivalent monetary value of energy consumption reduction from activities/projects collaborating with customers 	<ul style="list-style-type: none"> • (None identified)

Table 7 Sustainability metrics : Health and Safety

Category	Company level	Supply chain level	Stakeholders level
Impacts to employee	<ul style="list-style-type: none"> • Injury rate (IR) • Occupational disease rate (ODR) 	<ul style="list-style-type: none"> • Percentage of suppliers who commit to reduce risk in working condition 	<ul style="list-style-type: none"> • (None identified)

Category	Company level	Supply chain level	Stakeholders level
	<ul style="list-style-type: none"> Absent rate (AR) Percentage of the total workforce represented in formal joint management-worker health and safety committees Percentage of suppliers who meet health and safety criteria Risk mitigation of safety work place and work condition 	<ul style="list-style-type: none"> Total number of activities/projects collaborating with suppliers to reduce risk in employee's health and safety Total number of activities/projects collaborating with customers to reduce risk in employee's health and safety 	
Impacts to customer	<ul style="list-style-type: none"> Total number of non-compliance events in health and safety of 	<ul style="list-style-type: none"> Total number of re-designed product or process to reduce negative health impacts to customers by mean of collaborating with suppliers. 	<ul style="list-style-type: none"> Total number of incidents of non-compliance with the health and safety impacts of products and services Customer satisfaction in health and safety issues

Table 8 Sustainability metrics : Human capabilities

Category	Company level	Supply chain level	Stakeholders level
Knowledge and working skills	<ul style="list-style-type: none"> Average hours of training per year per employee-by-employee category. Total number of training courses which encourage sustainable attitude Total number of patents 	<ul style="list-style-type: none"> Total training hours which collaborating with suppliers and/or customers 	<ul style="list-style-type: none"> Total expenditure in social activities for education. Total number of activities/projects which encourage knowledge development for stakeholders
Employee's Moral	<ul style="list-style-type: none"> Employee's turn over rate Employee training satisfaction Employee job satisfaction 	<ul style="list-style-type: none"> (None identified) 	<ul style="list-style-type: none"> (None identified)

Table 9 Sustainability metrics : Ethics

Category	Company level	Supply chain level	Stakeholders level
Human Rights	<ul style="list-style-type: none"> Total hours of employee training on policies and procedures concerning aspects of human rights that are relevant to operations, including the percentage of employees trained. 	<ul style="list-style-type: none"> Percentage and number of agreements with suppliers that include human rights or that have undergone human rights screening 	<ul style="list-style-type: none"> (None identified)

	<ul style="list-style-type: none"> Percentage of contracts with significant suppliers and contractors that were either declined or imposed performance conditions, or were subject to other actions as a result of human rights screening. 		
Ethical issues	<ul style="list-style-type: none"> Total number of standards of ethical behavior which are applied in the company Total number of Actions taken in response to incidents of corruption. Percentage of employees trained in organization's anti-corruption policies and procedures. Percentage and total number of business units analyzed for risks related to corruption. 	<ul style="list-style-type: none"> (None identified) 	<ul style="list-style-type: none"> (None identified)