



*Global Business Research Congress (GBRC), May 24-25, 2017, Istanbul, Turkey*

## EVALUATING THE SUSTAINABILITY OF PRODUCTION IN TERMS OF ENVIRONMENTAL DIMENSION

DOI: 10.17261/Pressacademia.2017.388

PAP-GBRC-V.3-2017(3)-p.21-30

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### To cite this document

Erdil, A., M. Erdil, (2017). Evaluating the sustainability of production in terms of environmental dimension. PressAcademia Procedia (PAP), V.3, p.21-30

Permanent link to this document: <http://doi.org/10.17261/Pressacademia.2017.388>

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### ABSTRACT

The most significant element of the sustainable system depends on their own limits. For instance, Water is the most crucial one of all, since it's a significant input for essentially every industrial production and manufacturing step. This situation symbolizes that there is a limit to the amount of location, water, energy sources and all sources, input elements of the system supported by the world. The sustainability of materials, natural sources are vital needs for the households. What households consume today will not be enough for the next generation. If a product is not used up and throws away rapidly, the consumer needs a new one, and so there are requirements to produce with raw materials and resources again. If the good does not have the capability of being recycled, manufacturers will give damages, harmful to the environmental location. The term "water, energy footprint" and "carbon footprint" is put forward to measure the total volume of carbon dioxide emission and also natural water and energy resources used for manufacturing processes, or used by an individual or a community. All the activities and requirements of the population are caused greenhouse gasses emission. These concepts and results induce the climate change of the world. Regarding to the main subject which is defined in the above, the aim of this research is to investigate some developments which decrease the amount of waste in the industrial production stages and at the end of lifecycle time of products. The purpose of this study is to present a general review of the sustainability literature to decrease the amount of waste and to evaluate the environmental oriented production and consumption by SWOT Analysis; This research involves main concepts of environmental dimension of sustainability that aims to declare the significant of the carbon and water footprint for the ecological life.

**Keywords:** climate change, ecological life, environmental sustainability, footprint, swot analysis.

**JEL Codes:** L600; L23; L15

## **1. INTRODUCTION**

Much more studies focus on to analyze the interconnection among pollution, economic and society development for modern and developing industrial countries. In this studies, carbon dioxide footprints, pollution, energy resources decreasing for ecological changing, variables have been declared; government effective, strategic policies, regulations, and control for subversion of society values have been considered, examined. The conclusions present dependent and independent values are connected in the sustainable development model. Some variables depend on the environmental dimension of sustainability have a negative impact on economic improvement and also the sociable dimension variables have a positive impact via economic improvement in this research area (OECD, 2001-Url 2; WCED-UN, 1987).

## **2. IMPACT OF ENVIRONMENTAL AND ECONOMIC DEVELOPMENT: ADAPTION OF PROCESS OF GLOBALIZATION OF TURKEY**

Green growth means green sustainability is defined as an economic improvement and maturation equipment which substances that occur naturally are consumed expeditiously, ecological humiliation is averted, social happiness, prosperity, and employment are enlarged, raised while decreasing poverty and providing development, effective and essential, significant technologies dependent structure of green sustainability and growth (Url 8; Url 9).

GSCM is a significant concept to provide environmental evaluation and thought in traditional Supply Chain Management (Zhu et al., 2012). Environmental or green purchasing or procurement can be declared to provide the integration of environmental conditions into purchasing policies, programs and actions to reduce waste and to support the GSCM (Russel, 1998; Varnäs et al., 2009).

Every country might support and provide to the universal sustainability including its perspective abilities and occasions via generating its own "green growth- sustainability" regulation framework. While the abilities, skills for green growth are estimated, industries which consist occasions for understanding sustainable improvement sight-vision are concluded consuming natural sources extremely (Ahi and Searcy, 2013).

This situation presents to require the computing ecological expenditures integrated renewable energy sources with decision-making procedures and gathering all of them via the application, regulation for decreasing the physical force and potential of the energy industry on ecological location and natural raw materials.

## **3. GREEN DEVELOPMENT DIRECTION FOR SUSTAINABILITY OF TURKEY**

The structure of sustainable improvement is to guarantee fair and honest occasions concerning improvement advantages for recent and next generations by estimation of the mutual actions among social, environmental ecological and economic subjects in an interconnected framework. Economic development (an increase of the economic resources of a country or community) has usually been the most significant issue in the sustainability improvement. Although, the significance of ecological and social subjects for improvement has been identified current equipment and mechanisms and to improve supplemental and modern instruments regarding to build an improvement approach which provides essential to ecological variables while supporting economic development for human, people evaluation (Url 9; OECD, 2001-Url 2).

Greenhouse gas (GHG) concentrations cause Global warming, climate change results. According to this fact, much more business support and apply green principles such as using environmentally friendly raw materials and recycled paper for packaging and reducing their use of fossil fuels. These green principles have been expanded to many areas, including supply chains (Chung and Wee, 2008; Lin et al., 2011; Wang et al., 2012, 2010). Including the 'green' notion to the 'supply chain' definition generates a new paradigm where the supply chain involves a direct connection to the environment (Diabat and Govindan, 2011; Wang et al., 2010; Zhu and Sarkis, 2006; Eltayeb et al., 2011).

**Table 1: Categories of the Impact of Sustainability Dimensions**  
 (from Url 9; Url 10; Allwood, et al, 2006; Mirzapour et al., 2014 adapted by author)

Reduced Environmental Footprint		Increased Social Values	
Category	Impact - Influence	Impact - Influence	Category
Green Gas Emission	The more density the population is higher strength of the use will be. Combined with public transportation to increase the utilization rate and reduce carbon dioxide emissions.	From the point of land carrying capacity, population over-development will affect the environment and it's conducive to climate change.	Asset Recovery
Land use	Residential areas, work areas and retail stores should be distributed along the mass transit system. Compact with the mixed-use concise community development to strengthen reusing, reduce to buy much more products and so provide to produce enough and less production and reduce the carbon dioxide emissions.	Mixed land use and economical level pf householder influence quality of the living environment, pollution and housing type.	Prosperity & Economic Resilience
Persistent Toxic Emissions	Revenue on modern material goods, stuff could supported to finance improvement of material, matter re-use and second hand innovation and business, modes to achieve the effect of reducing energy and carbon reduction. decreasing the level of water, energy and toxicity	When Buying a part of products, goods of twice second hand quality possibility provides the active financial expenditure via the ecological and environmental effect that breach the sustainable development concept if the land development area is located in remote areas.	Biodiversity & Ecological Resilience
Water and Energy Intensity	Require for obvious knowledge on good, product effects, learning to connect this knowledge to damage results, importances and support improvement of combined activities, usage to achieve the goal of lower carbon emissions and decreasing the usage of water and energy resources.	The intersection traffic signals would delay travel time, increase air waste emissions, resulting in carbon dioxide concentration increase and causing greenhouse effect and climate changes.	Health & Safety Improvement
Production Design	Good products design helps in relevant entities of the manufacturing or base configuration of producing, manufacturing and others along with the service, production industries	The absence of ecological elements in product design did not considerate the impacts of climate change and global warming	Poverty Alleviation
Material Intensity	Profit from combined cost services (for instance, product life construction rather than purchases from new matters and raw resources)	Revenue on modern material goods, stuff could supported to finance improvement of material, matter re-use and second hand innovation and business	Resource Conservation

This essential impact turned into more obvious according to the globalized, generation issues in current time similar as ecological change, economic turning point, the state of financial and commercial hardships and climate change. Green sustainability is one of the approach, perceptions which is a section of actual arguments and considered to speed up the current assays, attacks to provide/support sustainable improvement destinations (see Table 1).

The associations and business must focus on the issue of sustainability in their facilities and activities. Sustainability is generally declared like that using and consuming resources to provide the needs of the present regardless of future generations, population's ability to supply, meet their own requirements (WCED, 1987). Supply chain management (SCM) is a significant topic of sustainability. It has two terms which are named green supply chain management and sustainable supply chain management (Ashby et al., 2012; Mirzapour et al., 2014).

### 3.1. Green Design

The most effective way to decrease negative environmental impact is by integrating environmental issues in product design, development cycle as 80% of product environmental impacts are specified in the design phase (Buyukozkan and Cifci, 2012). The green design contains activities which purposes to decrease products negative impacts on the environment during its total life cycle (Beamon, 1999; Eltayeb et al., 2011; Hervani et al., 2005; Zhu et al., 2007).

### 3.2. Green Production Processes

Green industrial manufacturing and production stages determine the ecological management strategy, policy of the business and its environmental sustainability image within results in the Manufacturing area and production station. Such stages are a multi-machine system, cell, equipment, line, fabricated-oriented systems and combine much more components through the supply chain (Reich-Weiser et al., 2010). The green production processes in the industry are generally correlated to the isolation of functional improvements (Fuller and Ottman, 2004).

### 3.3. Green Manufacturing

According to the Organic Trade Association, "organic agriculture" is an ecological production management system that promotes and enhances biodiversity. An ecological production management system supports and provides the variation in life forms for Organic Agriculture with respect to the Organic Trade Association. This factor focuses on the minimal use of inputs and continue, provide ecological agreement. In this topic, water consumption footprint is an important environmental result which relies on with raw material for the production of the industrial sector.

### 3.4. Objectives of Each Element of Green Supply Chain

According to Emmet and Sood (2010), Green Procurement and Supply Includes the selection of products and services to minimize the impact on the environment.

Green Production: Involve re-engineering phases to manufacture and produce with low emissions and low expenditure.

Green Packaging: Packaging design with optimized thickness and recyclable materials.

Green Marketing: Providing new markets through customer awareness.

Green Logistics: Optimizing total logistics costs, emissions and on time delivery.

Supply Chain: Change end of life products for reprocessing.

#### 3.4.1. Why firms Go Green

According to the previous research, it has based on a great amount of internal and external factors (for example, business size and possession framework). Nowadays, business companies supply to invest for green technologies. Companies support the concept of environmental sustainability which coordinates social factors with profit occasions. The implementation of resource-efficient technologies develop the competitiveness of a business and the green production phases have been combined to higher returns on investment funds and expanded kinds of sales (Worrell et al., 2009).

## 4. GREATER ELECTRICITY AND WATER CONSUMPTION

When the manufacturer requires more products than before time, the companies consume greater energy and water so, the volume of water, energy and also carbon footprint increase. The allocation of renewable energy inside part of the universal energy is insufficient. These factors cause ecological unbalance and climate changes. This can be named like More Electricity and Water Using Up (More Electricity and Water Footprint for Producing)

Carbon, water, and energy footprints are very significant concepts for our life since we usually encounter footprints in our daily life (industry, houses, buildings, transportation etc.). Because we usually come up those footprints in all of the places.

For example, people usually use bus, plane, ship etc. transports. So the vehicles are given CO<sub>2</sub> emissions and GHGs in the atmosphere.

The footprints are a very important parameter for our life. Also, the footprints are existed and occurred in all of the conditions in life. For example; ecological damage with technology, industrialization etc. factors occur these footprints. Water is the most crucial one of all since it's a significant input for essentially every industrial production and manufacturing steps (Url 3; Url 4, Url 5, Url 7).

While using the water in producing, manufacturing these stuff, products; it is highly polluted by the chemicals such as bleach (for paper or white T-shirts), lead, arsenic, and cyanide (for mining metals). It is dangerous that those toxins will penetrate into the groundwater (Url 10; Url 11).

Water is indispensable for life, especially for the future generations. It should be used reasonably. Water management programs should be established with the aim, objective of long lifecycle time, long-period sustainability, ecological, environmental entirety, cooperative participation in decision making, and fair interconnection. There is a universal evaluation sustaining the idea of managing water-used honestly instead of via private companies. Besides, there is a framework of "water-safest- authority" idealists, (radicals) who make efforts in order to establish a UN convention that guarantees everyone's right to use water (Url-1).

The term "water footprint" is put forward to measure the overall amount of fresh water used for manufacturing processes, or used by a subjective or an agreement

## **5. PERSPECTIVE OF SUSTAINABLE IMPROVEMENT ON ENVIRONMENTAL PERFORMANCE OF MANUFACTURING FIRMS**

Sustainable development and progress is the basic and key issue, the destination of every country. Examination of disposition as an unrestricted resource via humanity; purposed ecological topics and not to apply the resources efficiently.

The growth of the earth population, ordinary existent which can be on the specific location of disabling attended to the countries to discover for different methods for humanity; Sustainable improvement content obtained significant impacts from the previous period. Sustainable improvement perception demonstrated from this methodology.

A sustainable shipment framework which supports security for Turkey provides ecological friendly sensible services, approachable security, flexible and comfortable services and supports to the growth of aggressive and welfare of life. Some significant issues of this perception is mentioned as below;

### **5.1. Structure of Industrial Environment**

Industrial Environment is a standardized method of reviewing which might support new opinions to the development earth so as to improve sustainability (Efrenfeld, 1997).

The stage of industrial structure indicates to every person actions holding location within a development association containing the usage of innovation, matter and energy resources. This aspect signs to the environment on a systematic structure (Erkman et al, 2003). Providing industrial procedure is significant for Turkey according to the economic issues same as social purposes.

Within this structure, this is aimed to

- Improve new goods, stuff with high bazaar variable and generate employment convenience.
- Improve ecological and environmental goods and stuff.
- Improve ecological-friendly benefits of dangerous matters consumed same as inputs to provide green technology and innovations.
- Support for manufacturing, generating new products sustainability and fertility, work rate.
- Increase the consumption of clean energies, innovations, especially between Small Middle Entrepreneurs.
- Evaluate the ecological perceptive development conversion requirements of sectors.
- Increase arrangement as reusing and recycling in the industry sector.

Industrial Environment such as a content involves usage of a symbol (implied comparison) complement industrial frameworks with essential ecological life (Bouten et al, 2011). Natural ecological life operations interconnect and determine in a method to guarantee the continuation of this structure. So, this frame must support to provide a method to optimize capability so as to alive and sustain from the probable reduction of natural and financial sources (Bcst, 2005).

Possible for green development according to production framework of the system is suitable for the ecological area and goods safety procedures. Although, shortening lifecycle of products consume harmful matters for generating inputs need more suitable waste management. For instance, much more amount of electric and electronic disposal, garbage consisted of valued matters like copper and gold extra harmful and dangerous elements were composed and converted.

**Figure 1: Effective Relations of Major Categories of Sustainability of System Based Factors**  
(Url 8; Url 9; Allwood et al, 2006, adapted-modified by author)

Factor Category	Factor Variety	National Rate Instances	Association Rate Instances
RESOURCE FLOW FACTORS	Volume ; Recovery; Quality ; Influence	Green gas Emission; Material Flow Volume; Resource Depletion Rate	Recycling Proportion ; Material Flow volume ; Greenhouse gas emissions; Land use ; Water treatment Efficiency
VALUE GENERATION FACTORS	Economic Output; Income ; Capital Investment; Human Development ; Profitability;	Assignment of activity will reduce nature and culture; Cost(reduction); Energy Efficiency(increase)	Cost(reduction); Energy Efficiency(increase); Product Consumption
ADVERSE OUTCOME FACTORS	Influence; Risk; Loss; Exposure;Incidence	Life cycle footprint of energy use; Public security; Health Effects of pollution types	Public security; Health Effects of pollution types; Sewer overflow oftenness
SYSTEM SITUATION FACTORS	Growth ; Satisfaction ; Quality of Life; Wealth ; Health ; Capacity ; Dignity	Household Oncome; Employment; Water, Energy, Air Quality	Association educational equality; Housing Density; Local Public Employment; Infrastructure Durability ; Local Public Household Income

Increasing the level of the social life benefits and ecological advantages of the improvements support the green growth for the services industry and sectors of Turkey. This structure contains Sustainability of System Based Factors to supply the benefits of sustainability management (see Figure 1).

Boons and Baas define three items that industrial structures might imitate from universal environmental lifecycles:

- 1) Decreasing energy consumption requirements, disposal, and CO2 footprints production and using up, devouring of raw materials, natural sources.
- 2) Disposal and Goods used such as input for another industrialized, manufacturing stages, and operations
- 3) Establishment, generation of complex and manageable structures so as to allow and harmonize unexpected replacements, and variations in environments of system's framework (Boons and Baas, 1997; Erkman et al, 2003).

**5.2. Environmental Green Production and Eco-effective Structure**

The eco-effective framework is a requirement for firms such as it provides these companies to view the probable of manufacturing in a larger amount and much more quality during consuming fewer sources and purposing less effect to the ecological life (WBCSD, 1998-Url 12). All contents have preventative policy and regulations used via firms like a section of this framework environmental, ecological management. These could support firms develop via decreasing the volume of companies' resource utilization and using up and environmental mental weights as well as reduction, decreasing these risks conditions and connected accountability (WBCSD, 1998-Url 12).

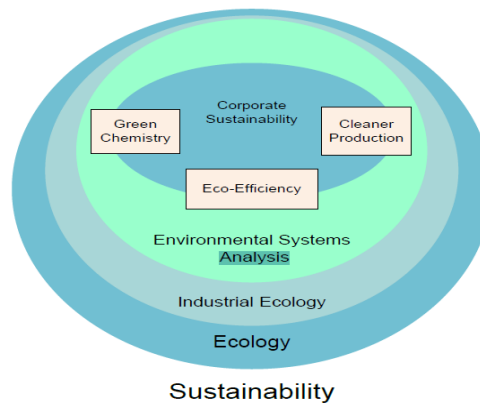
Interconnection management supports the implementations techniques for the supply chain management system, for example, raw matters provide control, choice the design of goods etc. Sources productivity or usage optimization must provide to use and consume the matters efficiency along all process of the stream (Url 6).

**5.3. Evaluation for Sustainable Improvement**

Three classifications of assessments could be respected: Approaches involving two or more governments; scientific technocratic estimations (STE); and scientific research cooperation, organizations (SRC).

From a financial framework of the visual aspect, this contains the optimum method of providing financial efficiency, competing and less ecological harmful (less disposal manufactured declares more effective procedure and less expenditure). Certainly, respected a social impact, this structure contains the conversation towards sections of the system so as to organize activities, change sources and knowledge to keep and provide an "industrial symbolize"(Efrenfeld, 1997).

**Figure 2: From Green Engineering Frame to Structure of Industrial Ecology and Sustainability (based on Diwekar, 2005)**



The stage of industrial structure (framework) presents the interconnection of an industrial procedure not merely with its ecological life around the structure, however also accompanying the all industrial association (Diwekar, 2005; see figure 2).

## **6. EVALUATION AND DETERMINATION THE IMPORTANCE OF THE ENVIRONMENTAL ORIENTED PRODUCTION AND CONSUMPTION BY SWOT ANALYSIS**

The SWOT variables are declared according to the prior experience of the researchers, experts of this sector and also withdraw support of brainstorming technique. The Swot analysis provides to make suggestion and decisions about problems in the framework of improvement of green-oriented manufacturing.

This application contributes to assessing the problems generating real and actual business threats-risk and benefits conditions with quality problems and cumulative sustainability of green production. The same method is implemented as rating type questionnaire survey. All questionnaires are evaluated in qualitative nature. The questionnaires are assessed with facilities reports of business and interview of experts. (Bernroder, 2002; Koo et al., 2008 and Hannah Koo et al., 2011). Figure 3 shows the strength, weakness, opportunity and threat components of the sustainability of green-oriented production and consumption.

**Figure 3: Evaluation the Quality Development of Textile Industry by Swot Analysis (Modified from Lee and Chen, 2010, Jayaraj et al., 2012; Dadashian et al., 2007; Hax and Majluf, 1991; Keane and Velde, 2008 by author)**

STRENGTHS	WEAKNESS
<ul style="list-style-type: none"> <li>-Decrease water consumption of manufacturing process</li> <li>-Green Design</li> <li>-Decrease greenhouse gases (GHGs);</li> <li>-Modify to climate variability, extremes</li> <li>-Improve alternatives for insufficient appropriate resources (energy, materials)</li> <li>-Removal of quota restrictions to give a major boost.</li> <li>-Upgrade corporate image and product reputation, increase market share</li> <li>-Start with the ecological challenges which provides to exist future markets and declare areas where such challenges, trends support requirements in organizations</li> <li>-Minimize waste and lower price for consumers.</li> <li>-Environment friendly</li> </ul>	<ul style="list-style-type: none"> <li>- Relations in the sustainable of green supply chain can provide to practice green implementation</li> <li>-Requirement Research and Development expenditure to determine green solutions for adapting technology.</li> <li>-Lack of regulations and guidance</li> <li>-Lack of technical experts and experience.</li> <li>-Lack of ecological knowledge.</li> <li>-Fragmented Industry,</li> <li>-Effect of Historical Government Policies,</li> <li>-Technological Obsolescence</li> <li>-Expenditure of ecological friendly packaging</li> <li>-Slow speed of sample development</li> </ul>
OPPORTUNITY	THREATS
<ul style="list-style-type: none"> <li>-Eliminate chemical, air, water pollution; health risks (wastemanagement, toxics)</li> <li>-Reduce Reuse Recycle – reduces cost</li> <li>-Support to increase demand of customer for green products/services.</li> <li>-Provide advantage of government incentives for manufacturing green products</li> <li>-Reduce Risks</li> <li>-Awareness of ecological standards between the countries via supply chain relations</li> <li>-Maximize reuse and minimize waste</li> <li>-Environmental challenges requires innovation and collective action by multiple parties across the value chain and beyond.</li> <li>-Effective environmental measures.</li> <li>-Ensure supply of freshwater (water quality, quantity)</li> <li>-Focusing on Product Development</li> </ul>	<ul style="list-style-type: none"> <li>-Increasing the carbon, water and energy footprints</li> <li>-Government influence.</li> <li>-Lack of participation of top management in acquiring green business, green production.</li> <li>-Competition in Domestic Market (Market competition)</li> <li>-High quality standard expected from international customers</li> <li>-Need to revamp Consumer Consciousness</li> <li>-High water consumption.</li> <li>-Lack of global green and quality certification system can support pretended green products.</li> <li>-Products can confront import barriers in global markets.</li> </ul>

## 7. EVALUATION AND CONCLUSION

This research is an evaluation of the green level production of industry. It is about the problems encountered the industry and the suggestions submitted during the research. Some suggestions are applied using the experience obtained. This study contributes the future studies on this issue.

A critical success factor in achieving clean green supply chain operations in the competitive area, to ensure that all the operations must be performed in a holistic way. With regard to organizations, providing to achieve the green supply chain targets in competitive landspace, they have to convert their activities according to their supply, product, packaging, marketing, and logistics facilities.

A critical success factor in achieving clean green production and supply chain operations competitive area, to ensure that all the operations must be performed in a holistic way. It is a significant decision for the organizations to operate their production operations; therefore it has several benefits for them. Such as minimum cost saving, great competition area, environmental protections etc. in other way, infrastructure costs of building supply chain operations are high.

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