FUTURE TRENDS FOR ENVIRONMENTAL SUSTAINABILITY OF GARMENTS ACCESSORIES & PACKAGING INDUSTRY IN BANGLADESH

Think you know packaging? Think again.

A seminar paper for: Bangladesh Garments Accessories & Packaging Manufacturers& Exporters Association (BGAPMEA) INSPIRED Project Funded by the European Union

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Executive Summary

The Global Green Packaging market was estimated at US$212.1 billion in 2015 and is projected to reach US$274.15 billion by the end of 2020 which is growing at a Compounded Annual Growth Rate (CAGR) of 5.27%. Asia Pacific is leading the market with 37% share in 2015 followed by North America and Europe. Recycled content holds the major share of 92% in 2015. The report also considers key trends that will impact the industry and key profiles of leading suppliers of Global Green Packaging Market. World magazine partnered with DuPont to identify trends shaping the packaging industry today and in 10 years. Responses reflect the insights of nearly 500 industry professionals predominantly in Europe and North America working for consumer goods manufacturers and converters in marketing and packaging development roles. Food, healthcare and beverage markets ranked the highest, but nearly every industry that uses packaging was represented.

Sustainable packaging is the development and use of packaging which results in improved sustainability. This involves increased use of life cycle inventory (LCI) and life cycle assessment (LCA) to help guide the use of packaging which reduces the environmental impact and ecological footprint. The green packaging market across the globe is expected to experience a stable growth from 2015 to 2021. Green packaging alternatively known as sustainable packaging and the market is segmented on the basis of application, packaging type and geography. The packaging type is further bifurcated into recycled content packaging, reusable packaging and degradable packaging. The various categories of recycled content packaging are paper packaging, plastic packaging, metal packaging and glass packaging among others. The reusable packaging is divided into drums, plastic container and others. On the basis of application the green packaging market has been segmented into food and beverage packaging, personal care packaging, health care packaging and others. By geography, the green packaging market has been segmented into North America, Europe, Asia-Pacific and Rest of the World (RoW). Increasing environmental concern is one of the major factors fuelling the demand for green packaging globally. Owing to this factor, considerable efforts are being made for reduction of toxic waste emissions. Green package results in very less toxic emission and causes less pollution in the form of landfills. Consequently, there is an increasing demand for green packaging to keep the environment clean and pollution free. Moreover, owing to increase in government's initiative to clean the environment, strict regulations are formulated by governments globally. Manufacturers are now under pressure to use eco friendly material in packaging and adopt methods that have less adverse impact on environment. Consequently, many industries have to adhere to green packaging as a part of their Extended Producers Responsibility (EPR). This factor is also boosting the market to a great extent. In addition, the use of green packaging gives competitive advantage to industry over other market players since consumers prefer products having sustainable packaging over others. Owing to this factor, the

demand for green packaging is increasing and expected to grow rapidly during the forecasted period.

However, reduction in profit margin due to increase in production cost is one of the factors restraining the growth of green packaging market. In addition, limited consumers demand due to lack of awareness regarding green packaging among consumers also limits the industries to switch to green packaging. However, government is taking initiative to make people aware of the importance and benefits of green packaging. In spite of these restraining factors the green packaging market will stand firm during the forecasted period.

The U.S is the largest market for green packaging because of the extensive use of eco friendly packaged products. Asia-Pacific region especially India and China offers the fastest growing market for green packaging. The population of the Asia Pacific region is large and growing considerably. The increasing population accounts for a better consumer base in this region. Food and beverage industry which constitutes the basic necessities of the growing population has better opportunity in this area and is emerging as the largest market for food and beverage in near future. These food and beverage industries use green packaging to a great extent for packaging their products. The global market for sustainable packaging is forecasted to reach US $244 billion by 2018.

The study focuses on key drivers, trends and technologies shaping the sustainable packaging industry. It also breaks down sales by type, end-use market and geographic region and provides comprehensive coverage of the global market and supply chain. Sustainability programmes are increasingly being seen as a source of innovation that can help in differentiating a company by appealing to the conscience of consumers. These programmes also serve as a platform for new product and market development. Consumer demand and government legislation around the world are the leading drivers for the sustainable packaging agenda. Environmental awareness among the growing population of consumers is fuelling demand for sustainability and the reduction of the impact of packaging on the environment. According to the study, the most common sustainable packaging trends are:

- Downsizing/light-weighting of packaging

- Increased recycling and waste recovery

- Increased use of recycled content

- Increased use of renewably sourced materials

- Improvements in packaging and logistical efficiency

In the recycled material packaging segment, paper packaging is the largest market, followed by metal, glass, and plastic. The demand for recycled plastics remains strong, but the material faces several challenges, including lack of infrastructure for collection and sorting, international

market competition for existing recovered materials and compliance with requirements related to food and drug content.

The biggest growth comes from the Asian market, driven by demand for sustainable packaging in countries like China and India. Boosted by a growing middle-class population that is increasingly becoming affluent and conscious of health and environmental issues, the demand for sustainable practices is driving the market for greener packaging. In 2018, Smithers Pira forecasts that Asia will be the largest market for sustainable packaging, accounting for 32% of the overall market.

The Sustainable Packaging Coalition (SPC), a project of GreenBlue envisions a world where all packaging is sourced responsibly, designed to be effective and safe throughout its life cycle, meets market criteria for performance and cost, is made entirely using renewable energy and once used, is recycled efficiently to provide a valuable resource for subsequent generations. In summary: a true and closed loop system for all packaging materials. Stringent regulations regarding sustainability, coupled with changing preferences towards more sustainable packaging materials are some of the major factors for growth of the sustainable packaging industry. The sustainable packaging market was valued at US$ 201.60 billion in 2014, and is projected to grow at a CAGR of 7.17% from 2015 to 2020. Degradable packaging is the fastest-growing process in the sustainable packaging market. In the material segment, paper & paperboard packaging is projected to grow at the highest rate. In terms of application, the food & beverage packaging segment is the fastest-growing segment, followed by the personal care packaging segment.

Value Addition for the Buyer:

- This report provides five year market forecasts with important statistical and analytical information on the device, technology, and application.
- This report provides a list of regulations relevant to sustainable packaging at the regional level.
- This report illustrates industry structure, driving parameters, major players, market shares, industry dynamics, and international developments relevant to sustainable packaging markets.
- This report provides detailing of each segment on country basis for a holistic view.
- This report provides a competitive landscape, which is a presentation of the companies' products and services.

Introduction:

The definition of sustainable

The adjective "sustainable" is defined as follows, "able to be maintained at a certain rate or level, conserving an ecological balance by avoiding depletion of natural resources," (Oxford English Dictionary).

Definition of Sustainable Packaging

The criteria presented here blend broad sustainability and industrial ecology objectives with business considerations and strategies that address the environmental concerns related to the life cycle of packaging. These criteria relate to the activities of the packaging value chain and define the areas in which we actively seek to encourage transformation, innovation, and optimization. We believe that by successfully addressing these criteria, packaging can be transformed into a closed loop flow of packaging materials in a system that is economically robust and provides benefit throughout its life cycle—a sustainable packaging system. Global standards and regulations on environmental performance continue to evolve with ISO Technical Committee (TC) 122/SC 4 now taking the lead. This Packaging and the Environment TC has working groups established on topics such as packaging optimisation, reuse, recycling and energy, chemical and organic recovery and draft standards are at the Committee stage.

Twenty years ago the buzzword in packaging was "biodegradable". The future was full of packaging that quickly and gently turned into something organic in our landfill sites to nourish the earth beneath our feet. Realistically, that was not going to happen. Most materials, whether paper or polymer based require differing combinations of oxygen, ultra violet light, moisture and heat to break down and no one wants to leave these items in the open air for that to happen.
The mission of the Sustainable Packaging Coalition is to use thorough research and science-based approaches to help advance and communicate a positive, robust environmental vision for packaging and to support innovative, functional packaging materials and systems that promote economic and environmental health. This document articulates a definition of "sustainable packaging" so the packaging value chain can work toward a common vision. By providing a comprehensive set of criteria that encompasses the systemic nature of sustainability for packaging, this definition also identifies where action can and should be taken by the packaging industry to evaluate current efforts, identify opportunities, and begin to pursue strategies to develop more sustainable packaging materials and systems. This definition is intended as a "target vision" for companies to strive toward through continuous improvement and will evolve over time with new materials and technologies, leading to more sustainable packaging systems.

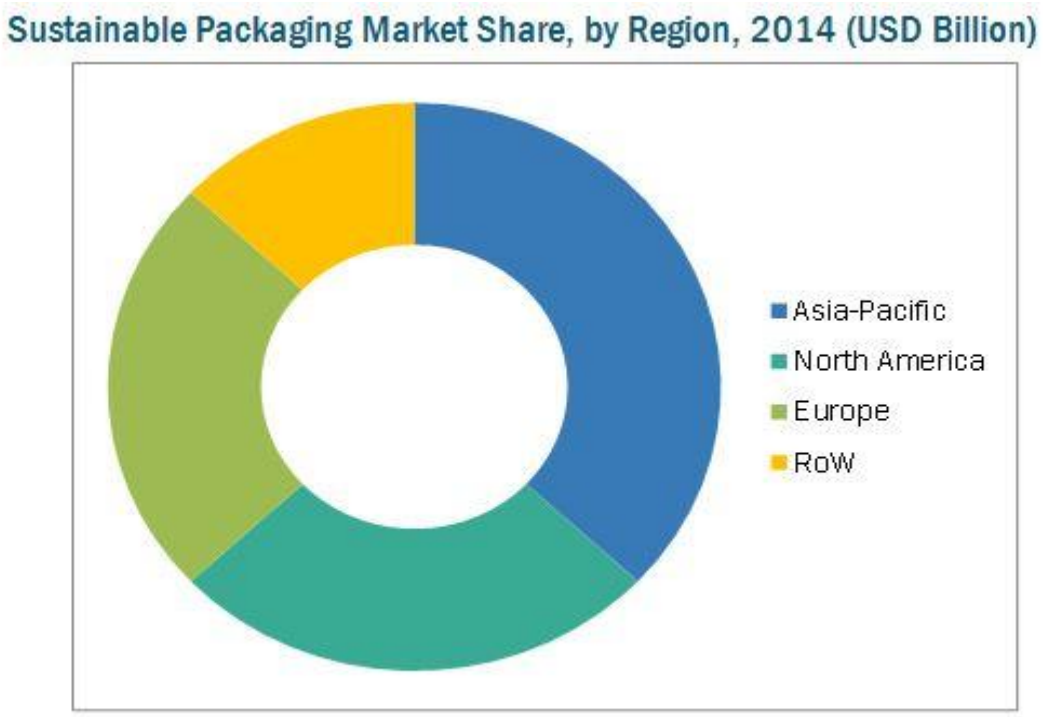
Sustainable Packaging-an overview:

Corporate sustainability is evolving. In its early days, sustainability was tantamount to reducing harm by making products and processes "less bad." With a glimpse of the competitive advantage that could be achieved, companies began to embed sustainability principles at the core of decision-making. Sustainability today goes beyond the walls of the organization — it's now about using brand, purchasing and political power to influence stakeholders and create positive change.

Two terms have recently emerged to articulate what the "new sustainability" will look like: the "activist company" and "net positive." The activist company, a term coined in a trends report by Reputation Inc., refers to companies that "take ownership of issues they can influence beyond their organizations' boundaries." They do this by encouraging mindful consumption to reduce pressure on natural resources and minimize waste. They actively influence policy to create industry-wide change and collaborate with industry partners (and even competitors) to bring

about innovation. They take a stance on social and environmental issues and create meaningful incentives to encourage their consumers and partners to act in ethical and responsible ways.

The activist company is broadening its sphere of influence to strengthen its connection with consumers and get in front of sustainability issues that may impact future growth. Such companies are willing to use their resources and influence to address issues that impact their company, other organizations, their surrounding communities and the planet overall. Patagonia's "Don't buy this jacket" campaign is a case in point. By encouraging their customers to value quality over quantity, Patagonia is shaping consumer preferences and reinforcing loyalty to the brand, all while staying true to the company's longstanding ethic of corporate responsibility. Max Burgers in Sweden is deliberately encouraging its customers to eat less beef. Not only does their campaign build a relationship with consumers, it reduces their reliance on a costly and greenhouse-gas intensive product.



Source: Secondary Research, Expert Interviews, and MarketsandMarkets Analysis

Scope of the Report

This research categorizes the sustainable packaging market based on function, layer, process, material, application, and region.

On the basis of material, the sustainable packaging market has been segmented as follows:

- Paper & Paperboard
- Plastic

- Metal
- Glass

On the basis of function, the sustainable packaging market has been segmented as follows:

- Active packaging
- Molded pulp packaging
- Alternate fiber packaging

On the basis of process, the sustainable packaging market has been segmented as follows:

- Recycled content packaging
- Reusable packaging
- Degradable packaging

On the basis of layer, the sustainable packaging market has been segmented as follows:

- Primary
- Secondary
- Tertiary

On the basis of application, the sustainable packaging market has been segmented as follows:

- Food & Beverage packaging
- Healthcare packaging
- Personal care packaging
- Others (electronic appliances and home care packaging)

On the basis of region, the sustainable packaging market has been segmented as follows:

- Asia-Pacific
- Europe
- North America
- Rest of the World (RoW)

Thus, sustainability became a wiser choice in terms of making the best use of the world's resources in the long term. It also expanded far beyond the notion of making good use of resources. Today's sustainable products must meet criteria that are environmental, social and performance related, as shown below:

The demands placed on tomorrow's sustainable packaging		
PERFORMANCE	**SOCIETY**	**ENVIRONMENT**
1. Meets the market demands for value	1. Provides measurable benefits to individuals and communities	1. Makes efficient use of raw materials and minimises waste
2. Reduces the quantity of damaged or wasted products during transport, storage or use	2. Helps emerging markets grow economically	2. Reduces the energy needed to manufacture and ship products and the fuel customers need to ship and store their products
3. Helps customers operate more efficiently and enhances their products	3. Is safe and meets all regulatory requirements	3. Reduces greenhouse gas emissions associated with the overall package and contents of the package
4. Optimises the efficiency of the supply chain.	4. Benefits of CBSF	4. RRRR

The definition of what is sustainable has been adapted to fit different industries. For the paper industry, it can be about replacing felled trees by planting as many or more for the future. Within the packaging industry as a whole, organisations such as the Sustainable Packaging Coalition of USA and the European Organisation for Packaging and the Environment, have created definitions for "Packaging's Contribution to Sustainable Development." European has adopted the EU's Sustainable Development Strategy and this means that packaging should:

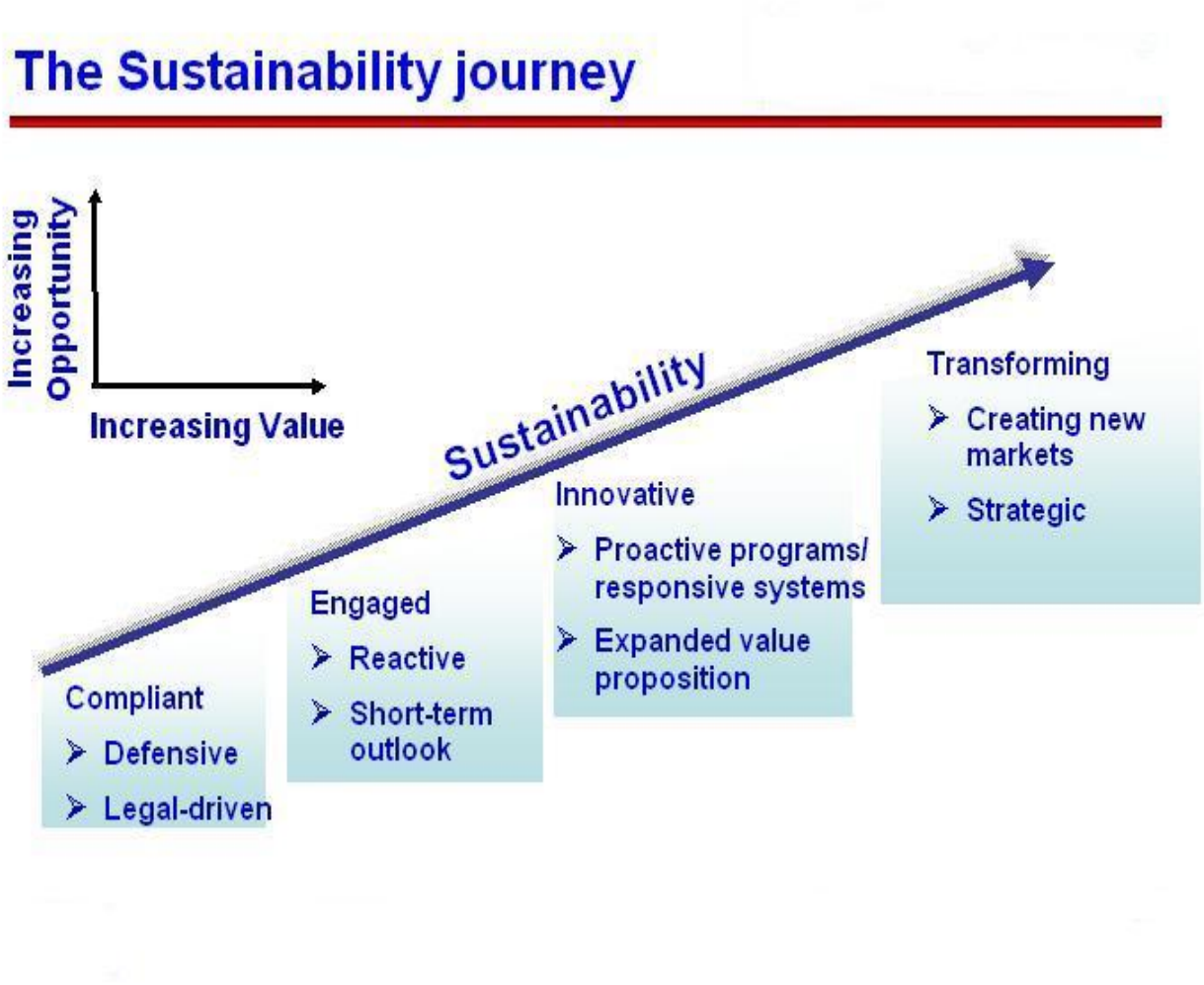
- be designed holistically with the product to optimise overall environmental performance
- be made from responsibly sourced materials
- be designed to be effective and safe throughout its life cycle
- meet market criteria for performance and cost
- meet consumer choice and expectations be recovered efficiently after use.

Sustainability Journey

There is an opportunity for every company to take a long hard look at its operations and to assess where it is on the path to sustainability. The figure illustrates the typical evolution a company will make. Some companies will find themselves starting out and being driven by legal requirements, others may be further ahead with ISO environmental accreditation or are being

proactive in their planning and communication. In the case of Sealed Air, its operational goals include such things as increasing saleable product ratio to 98% of raw materials used through improved yields and improved scrap reprocessing and reducing greenhouse gas intensity by 12% in 2010; both targets were met.

Regardless of where companies are today on this path, there is no doubt that by being higher to the right along the path companies are able to create increasing value for their customers and themselves and so create greater opportunities.



The sustainability journey

Taking big steps

Many examples of sustainable packaging focus on small steps. However, for long-term success, these steps are insufficient. The big steps that are needed focus on three important elements:

- Leveraging innovation in the packaging and packing processes

- Demonstrating performance in the product application
- Delivering value across the supply chain.

To do this, sustainability objectives must be built into the business goals and cause us to rethink manufacturing and design and value chain delivery.

Rethinking design and value chain

The brief was to create a new pack that would address all these issues and be a big step forward in sustainability, through rethinking the design. The results of using the new packaging system were:

*A 50% reduction in raw material usage

*A 50% reduction in the number of shipping movements required to take the product to market

*A more efficient process flow in manufacturing

*No compromise of the safety and regulatory requirements.

Rethinking manufacturing

As an active supplier in the shrink film market, Sealed Air wanted to innovate in a sustainable way. The step change came through the use of new manufacturing technology that has allowed the creation of a new patented film. The results are:

An increase in linear metres on a roll of up to 50%, leading to less transport for the same amount of material, therefore less emissions; and less roll changes at the customers point of manufacture.

- Leading to reduced power consumption
- Reduced storage space.

Reap sustainability rewards

Whatever your current position on the path to sustainability, rethinking design and value chain, and manufacturing parameters allows companies to make big leaps forwards. These lead to bigger results and bigger opportunities as your reputation for innovation and packaging expertise grows.

Sustainable packaging:

A. Is beneficial, safe & healthy for individuals and communities throughout its life cycle
B. Meets market criteria for performance and cost
C. Is sourced, manufactured, transported, and recycled using renewable energy
D. Optimizes the use of renewable or recycled source materials

E. Is manufactured using clean production technologies and best practices
F. Is made from materials healthy throughout the life cycle
G. Is physically designed to optimize materials and energy
H. Is effectively recovered and utilized in biological and/or industrial closed loop cycles

These criteria outline a framework for specific actions. The SPC recognizes that the timelines for achievement will vary across criteria and packaging materials. Together, these criteria characterize vision of sustainability for packaging.

Analysis of Criteria

Beneficial, Safe & Healthy for Individuals and Communities Throughout its Life Cycle

Relevance to Sustainable Development

In addition to "profitability" the other two pillars of sustainability, social equity and the environment are growing areas of corporate focus. As part of globalization strategies, multinational companies have expanded operations overseas and are increasingly being held accountable for actions resulting in negative social or environmental consequences. The emergence of corporate social responsibility and sustainability reports reflect the growing focus on corporate citizenship, accountability, and transparency. Leading companies are implementing holistic sustainability measures that benchmark, measure, and track progress across a wide range of environmental and social impact categories.

Relevance to Packaging

The global packaging industry in 2009 was estimated at $429 billion and employed more than five million people all over the world. The benefits of packaging to individuals and communities vary from the creation of meaningful, stable employment, to the protection, preservation, safety, and transport of products and foodstuffs. Packaging allows marketing and product differentiation and educates and informs the consumer. At the same time, the procurement, production, transport, and disposal of packaging can have negative consequences for both the environment and societies around the globe. The SPC believes that through intelligent packaging and system design, it is possible to "design out" the potential negative impact of packaging on the environment and societies.

Strategies & Opportunities

Packaging protects the environmental and economic investment in products and contributes to economic development and social well being by facilitating the distribution and delivery of products to the marketplace. However, after its useful life, packaging contributes to municipal solid waste that is managed at the community level. Effectively managing this waste is a challenge in many communities and especially in emerging or developing economies. Creating economically viable, closed loop systems for the recovery of packaging materials is an essential characteristic for sustainable materials management. Such a strategy supports individuals and communities through the creation of gainful employment, development of recovery

infrastructure, conservation of resources and measurable improvements in environmental performance. Corporate social responsibility, accountability and equitable wages are all part of creating a more sustainable system.

Market Criteria for Performance and Cost

i. Relevance to Sustainable Development

Economic growth and prosperity are essential components of sustainable development. The United Nations estimates that the population of the planet will grow from 7 billion in 2010 to 9.2 billion by 2050, roughly a 31.25% increase in global population. Efficient and productive industry engaged in truly sustainable practices is essential to meet the incredible increase in demand for goods and resources that this growth implies.

OECD Definition of sustainable materials management:

"Sustainable materials management is an approach to promote sustainable materials use, integrating actions targeted at reducing negative environmental impacts and preserving natural capital throughout the life-cycle of materials, taking into account economic efficiency and social equity." A goal of sustainable packaging is to facilitate economic growth by delivering the benefits of packaged goods without the negative impacts traditionally associated with packaging and related processes.

ii. Relevance to Packaging

Ongoing profitability is a fundamental element of sustainable business practice. Managing the cost of packaging procurement, production, and product delivery with the desired functionality and appearance is an element of a profitable business. The SPC membership has observed that the true cost of packaging is becoming more complicated as costs that have traditionally been borne by society (e.g., disposal) or environment (e.g., emissions) are being redirected to producers through legislation, levies, and stricter compliance regulations. Sustainable packaging design considers the full life cycle of the package, recognizes the principle of Shared Product Responsibility and consequently seeks to minimize the total packaging system cost through efficient and safe package life cycle design.

iii. Strategies & Opportunities

Sustainable packaging initiatives offer multiple strategies to meet and even exceed market criteria for performance and cost, including: improved package design, resource optimization, informed material selection, design for recovery and source reduction. Education of business colleagues, suppliers, consumers and regulators is also an important vehicle to connect a packaging strategy for sustainability to existing market needs. Collaboration across the packaging supply chain will facilitate understanding, help identify opportunities to improve materials and packaging systems and enable sustainable alternatives to be developed with minimal additional cost. Experience from other sectors that are starting to embrace the principles of sustainable business indicates that improvements in product quality and profitability are often

realized. Other benefits include brand enhancement and new sources of materials being made available through improved recovery systems. Innovative new packaging materials from renewable resources and step change advances in recovery/recycling systems, while still on the horizon for many materials, is actively being used in other parts of the world. While there may be costs associated with the transition to new packaging materials or recovery strategies, there can also be savings in the form of reduced regulatory and tipping fees and reduced environmental management costs.

Sourcing, Manufacturing, Transportation and Recycling using Renewable Energy

i. Relevance to Sustainable Development

The wide-scale use of fossil fuels as a primary source of energy in many parts of the world is a principal factor contributing to many local, regional, and global environmental issues including: climate change, acidification, mercury deposition, photochemical ozone, particulates and severe local impacts due to mining or drilling. Renewable energy potentially offers solutions to many of the environmental, social, and economic issues central to the development of a sustainable world. The most common types of renewable energy include solar energy (passive and active), wind power, hydroelectric, biomass (bio-fuels and bio-power), tidal energy and geothermal.

ii. Relevance to Packaging

Today most packaging materials and conversion processes rely on fossil fuel-based energy to a greater or lesser extent. The transition from fossil fuels to renewable energy throughout the packaging supply chain will require changes at many levels over a significant timeline. The greatest opportunity for extended product responsibility rests with those throughout the commerce chain – designers, suppliers, manufacturers, distributors, users and disposers , that are in a position to practice resource conservation and pollution prevention at lower cost.

Definition of Source Reduction from U.S EPA: “Source Reduction refers to any change in the design, manufacture, purchase or use of materials or products (including packaging) to reduce their amount or toxicity before they become municipal solid waste. Source reduction also refers to the reuse of products or materials.” medium term to migrate all materials and processes to renewable energy sources and that the rate limiting step will largely depend on local availability of a reliable supply of renewable energy and national energy policies. However, a transition to renewable energy is vitally important in those regions that are currently heavily dependent on imported fossil resources for their energy.

iii. Strategies & Opportunities

Companies are beginning to address the need to shift to renewable energy through a variety of strategies. In the near term, minimizing the use of fossil fuels and striving for optimal energy efficiency is an effective strategy for moving toward sustainability with very real economic and

environmental returns. At the same time, there must be a dedicated effort by companies over the longer term to diversify the energy mix and build momentum behind the transition to renewable energy. This transition can be supported through the direct use or indirect purchase of renewable energy, carbon credits or tradable renewable allowances. Transportation is a significant source of fossil fuel consumption associated with packaging. Companies experience direct cost benefit from improving fleet performance through optimized distribution and better fuel efficiency. Companies are also encouraging the use of alternative fuels, hybrid vehicles, and innovative technologies through internal measures or by acknowledging the efforts of suppliers. These types of activities help develop markets for renewable energy and offer alternatives to fossil fuel as strategies toward a more sustainable energy future.

Optimization of the Use of Renewable or Recycled Source Materials

i. Relevance to Sustainable Development

The use of recycled or bio-based and renewable materials from well-managed sources can contribute to sustainable material flows and help ensure the availability of materials for future generations. Using recycled materials (bio-based renewable or non-renewable) encourages waste reduction and the conservation of resources. Utilization of post-consumer recovered materials supports an ethic of stewardship, supports the development of markets and is an essential part of developing near closed loop systems. The use of bio-based renewable materials from well-managed sources reduces dependence on non-renewable resources, uses current photosynthesized carbon to create raw materials that have the potential to be greenhouse gas neutral and encourages more sustainable management of these resources.

ii. Relevance to Packaging

The use of bio-based renewable or recycled materials can support the development of sustainable packaging by improving its environmental profile and providing a source of future packaging materials. The physical deterioration of some materials through mechanical reprocessing (i.e., mechanical recycling) currently poses a limit to effective and economic reutilization of some packaging materials. As demand for finite land and material resources grows, innovation related to the recovery and use of recycled packaging materials is likely. Using principles of industrial ecology, materials should be recovered through either biological or industrial mechanisms or both and made available as inputs for new systems of production. Many bio-based and renewable materials are suitable for recovery through either biological or technical means. Materials from nonrenewable resources should be recycled to the highest degree possible. Since the value of these materials cannot be recovered through natural processes and may be persistent in the environment, they require a high degree of stewardship throughout their life cycle to ensure that they are collected, recovered and re-used.

Specifiers and designers striving for sustainable packaging should ensure the recyclability of materials, especially if they are made from non-renewable resources. Environmentally preferable procurement and prescriptive regulations regarding the environmental characteristic of packaging are expanding and often incorporate recyclability and recycled content requirements. The presence of infrastructure to collect and recycle materials is incorporated into some

definitions of recyclability. These definitions pose a significant barrier to material innovation as it continues to favor the use of existing materials versus the development of optimized materials that may not currently have infrastructure for collection and recovery.

iii. Strategies & Opportunities

Recycled or Bio-based and Renewable Source Materials- A key strategy for improving the sustainability of packaging is optimizing the use of bio-based and recycled materials. The availability, performance and price of some bio-based or recycled materials affect the feasibility of incorporating them into new packaging designs. Material and technological advances that positively influence of these factors substantially & improve the practicality of their use. The sourcing of recycled materials is closely linked to package design and the effectiveness of recovery systems. It is clear that demand for recycled materials and the creation of end markets is a key driver for strengthening the recovery and recycling industries needed to provide them. The quality of recovered materials is a prime concern to end users and often limits the use of recycled materials in many packaging applications due to concerns over contamination, appearance or physical performance.

Virgin Source Materials

One strategy used to address concerns associated with the production of virgin bio-based packaging materials is sourcing from sustainably managed and certified sources. This tactic is used currently to address forestry and to a lesser degree agricultural practices. While there is some focus on the sourcing of non-renewable resources through clean production, there is not a comparable set of well-accepted sustainability practices or certifications directed toward the value chain for the sourcing of non-renewable material resources, like oil or minerals.

Manufacturing using Clean Production Technologies and Best Practices

i. Relevance to Sustainable Development
Clean production refers to the continuous application of "an integrated preventive environmental strategy to increase overall efficiency and reduce risks to humans and the environment." This includes conserving raw materials, water and energy, eliminating toxic and dangerous raw materials and reducing the quantity and toxicity of all emissions and waste at source during production processes.

ii. Relevance to Packaging

Clean production represents environmentally responsible practice and applies to any industrial activity including the production of packaging. Packaging uses significant quantities of energy, water and materials in manufacturing and production processes. Clean production seeks to implement environmental practices and technologies to reduce the environmental impact of manufacturing processes including any toxics used or emitted.

iii. Strategies & Opportunities

Eco-efficiency strategies are currently pursued to reduce emissions, energy use, and waste. Some examples include voluntary emission reduction or elimination programs and switching to cleaner technologies. Encouraging companies and suppliers to ensure that their production processes meet clean production best practice standards and meet expectations for responsible manufacturing and worker safety is fundamental to linking manufacturing performance to sustainable packaging. It can also ultimately reduce cost; improve quality and long-term profitability by reducing risks and improving compliance. New approaches and technologies are on the horizon. Advances are being made on closed loop systems and beneficial reuse to eliminate wastes.

Definition of Green Chemistry: the design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances, encouraging signs that the technical and scientific intelligence that created the technological transformation of the 20th century is now being directed toward identifying solutions for some of the unintended consequences of our industrial systems.

Making from Materials- Healthy Throughout the Life Cycle

i. Relevance to Sustainable Development

Human and ecological health is a basic requirement of sustainable development. Material health is a principle that addresses the presence and release of harmful substances to the environment. Related to clean production, material health extends consideration of the use and emission of substances of concern through the use and end of life phases of packaging. The objective is to identify and minimize or eliminate hazards associated with materials used in packaging along the life cycle. The accumulation of problematic substances in the biosphere and in our bodies is the subject of increasing concern for consumers, health professionals, governments and companies.

ii. Relevance to Packaging

Packaging may use or contain certain chemicals that result in the unintended release of harmful substances during the life cycle of the package. While these chemicals are typically utilized in small amounts, the scale and quantity of packaging and associated wastes can render them significant. Ensuring all ingredients—including additives, inks, adhesives and coatings are safe for human and environmental health throughout their life cycle is a vital aspect of sustainable packaging design.

iii. Strategies & Opportunities

Careful selection and specification of the safest materials available to meet the package performance requirements is the preferred strategy. All companies should track legislation, material bans and substances of concern to identify compliance issues and minimize risk. Leading companies have clear restricted substance lists and are identifying alternatives for substances of concern in order to design out hazards where possible and take packaging design beyond compliance towards sustainability. There is also a need for greater transparency regarding what is in packaging materials and to encourage the optimization of material

formulations for human and environmental health. The development of tools and methodologies to assess material health is ongoing and will allow more transparent communication of material characteristics throughout the value chain.

Physical Design to Optimize Materials and Energy

i. Relevance to Sustainable Development

Seventy (70) percent of the overall impact of a product is determined in the design phase. By thinking about the entire life cycle of a product during the design phase and identifying critical aspects, it is possible to anticipate impacts and minimize problems and waste up front. For this reason, anticipatory design is a fundamental best practice for sustainable products and packaging.

"It is not possible to repeat too often that waste is not something which comes after the fact! picking up and reclaiming scrap left over after production is a public service, but planning so that there will be no scrap is a higher public service." Henry Ford, 1924

Definition of Green Engineering: The design, commercialization, and use of processes and products, which are feasible and economical while minimizing 1) generation of pollution at the source and 2) risk to human health and the environment.

"Green Engineering transforms existing engineering disciplines and practices to those that promote sustainability. Green Engineering incorporates development and implementation of technologically and economically viable products, processes and systems that promote human welfare while protecting human health and elevating the protection of the biosphere as a criterion in engineering solutions.

ii. Relevance to Packaging

Typically a company designs packaging to meet critical cost, performance, marketing, and regulatory requirements. Sustainable design for packaging starts with informed material selection, a clear understanding of performance requirements and adds consideration of life cycle impacts. These include: energy use over the life of the package, impact of materials in all end-of-life scenarios and appropriateness of the package design to facilitate material recovery. Other factors that should be considered in the design phase are consumer behavior and the variation of established recovery systems by market.

iii. Strategies & Opportunities

Several methodologies are currently used to support sustainable design including Design for Environment strategies like Design for Recycling and Source Reduction. Corporate strategies to address packaging design include developing sustainable design guidelines such as the SPC's *Design Guidelines for Sustainable Packaging* and embedding them within product development processes. It is important to note that sometimes the adoption of one design strategy over another may result in tradeoffs. One design, for example, may focus on minimizing energy impacts over the life of the package and another may focus on the use of recycled content. Internal corporate

sustainability objectives may influence the weighting of specific life cycle impacts and thus influence ultimate internal design strategies. In general, sustainable packaging design calls on designers to weigh these factors against each other and optimize them, while keeping in mind that optimizing for one parameter may shift the environmental burden to another. Standardization and communication of sustainable design strategies and their adoption by the packaging industry will create significant advances toward more sustainable packaging.

Effective Recovery and Utilization in Biological and/or Industrial Closed Loop Cycles.

i. Relevance to Sustainable Development

Economic expansion and the related growth in resource use are inconsistent with sustainable development. Creating sustainable flows of materials will reduce the overall use of finite natural resources and minimize waste. Effective recovery means creating the collection and recycling infrastructure necessary to close the loop on materials in order to provide valuable resources for the next generation of production.

ii. Relevance to Packaging

The greatest challenge to the development of sustainable packaging is the creation of economically viable and effective infrastructure and systems to collect and recover value from materials beyond their initial use. In addition, the recovery phase of the packaging life cycle is the recipient of the cumulative impacts of all upstream decisions, which can make collecting and recovering packaging challenging. Effective recovery implies the significant collection and recovery of material at the highest value that is economically feasible. As suggested by the discussion under previous criteria, effective recovery can be achieved through supply chain collaboration, by the coordinated efforts of the packaging system to create healthy and recyclable materials, by packaging designed for recovery and by establishing appropriate collection and recovery infrastructure with the combined support of end users—brand owners, retailers, consumers, and municipalities.

iii. Strategies & Opportunities

There are many methods of collecting and recycling packaging materials to recover their intrinsic value to society. In reality, the established recovery infrastructure in the country in which the product is sold/used, together with market dynamics, will ultimately determine the method through which a package will be recovered. Some of the more common recovery methods are discussed below.

The earth’s biosphere effectively recovers the nutritive value of basic biological materials. The conditions for effective biological degradation do not exist in landfills and the release of problematic substances is a further concern. It is necessary to engineer and manage biological recovery systems to ensure safe and effective recovery of value from biological materials. Managed composting and anaerobic digestion with energy recovery are examples of managed biological recovery systems, while landfills are not.

Technical Recovery (Recycling)

As nature cannot effectively recover many man-made packaging materials, engineered recovery systems are necessary to recapture their value and to avoid their accumulation in the environment. Some examples of technical recovery include mechanical and chemical recycling of plastics and thermal recycling of metals and glass. It is also possible to recover biological materials in technical systems (e.g., paper recycling). The ability to economically recover value varies by material, regional variations in infrastructure and technology and consumer behavior.

Energy recovery is increasingly used as a method to recover value from packaging materials. Safe incineration with energy recovery, waste to energy facilities and the use of plastic and paper as an alternative fuel are all energy recovery methods. These technologies represent conversion of material to energy. While energy recovery does not represent a sustainable use of non-renewable packaging materials (e.g., fossil fuel based plastics), it is a preferable alternative to landfills, litter or uncontrolled burning. For bio-based materials, energy recovery has different implications. Bio-based materials are a preferred alternative to fossil fuels as they are renewable and have the potential to be considered carbon neutral with respect to climate change. The best efforts to meet many of the criteria outlined in the SPC definition of sustainable packaging (e.g. performance and cost, renewable energy, safe materials, optimally designed packaging) will only result in sustainable packaging if it is collected and recovered effectively and efficiently. Ideally, when a new material is introduced to the market, clear and accurate communication following FTC guidelines about the material's recovery options, including disclosure of the most likely end of life option and suitability with existing infrastructure, should be made at the same time. This requires thorough understanding of recovery systems and coordination along the entire value chain regarding communication.

These comments are only valid for incinerators that do not emit dioxins and other pollutants into the atmosphere (i.e., they are equipped with appropriate waste air scrubbing and cleaning processes. The latter is referred to "safe incineration with energy recovery").Consumer demand, government legislation and technology advances will propel sustainable packaging to a UD$244 billion market by 2018, according to a new report by Smithers Para.

The Future of Sustainable Packaging to 2018 details market sizes, projections and five-year sustainable packaging trends to 2018, focusing on key drivers, trends and technologies shaping the sustainable packaging industry. The report breaks down sales by type, end-use market and geographic region and provides comprehensive coverage of the global market and supply chain. Sustainability programs are increasingly being seen as a source of innovation that can help in differentiating a company by appealing to the consciences of consumers. These programmes also serve as a platform for new product and market development. According to the study, the most common sustainable packaging trends are:

- Downsizing/light weighting of packaging
- Increased recycling and waste recovery
- Increased use of recycled content
- Increased use of renewably sourced materials

- Improvements in packaging and logistical efficiency

In the recycled material packaging segment, paper packaging is the largest market, followed by metal, glass and plastic. While the demand for recycled plastics remains strong, the material faces several challenges, including lack of infrastructure for collection and sorting, international market competition for existing recovered materials and compliance with requirements related to food and drug content.

Driven by demand for sustainable packaging in countries like China and India, the biggest growth comes from the Asian market. The demand for sustainable practices is driving the market for greener packaging, which is boosted by a growing affluent and health-conscious middle-class population. Smithers Pira forecasts that Asia will be the largest market for sustainable packaging in 2018, accounting for 32 percent of the overall market.

The report concludes that the issue of sustainable packaging will continue to grow in importance over the next decade and is predicted to become the number one challenge facing companies, beating cost and other issues by 2023.

Innovation in packaging has a wide reach, particularly in the food and beverage industry. European beer maker Carlsberg recently teamed up with a group of global suppliers to develop the next generation of packaging products that are optimized for recycling and reuse, otherwise known as "up-cycling." The companies will use the Cradle to Cradle Design Framework, created by professor Michael Braungart of Germany, to develop a Cradle-to-Cradle roadmap and assessment of their products.

Last year UK paper manufacturer James Cropper announced it has developed an innovative recycling process that incorporates cocoa husk waste from chocolate production into unbleached cellulose fiber to produce a food-grade paper. The company says turning the otherwise wasted skins of many of the 3.5 million metric tons of cocoa beans produced each year into paper could be a significant breakthrough for the food and packaging industries.

From "Less Bad" to "More Good"

The take-make-waste model has served companies well for decades but taking has its limits. Net positive has emerged to inspire a movement toward a restorative economic model that centers on giving back. Like the activist company discussed above, companies with net positive goals go beyond the boundaries of their operations to serve long-term business interests and create positive change in the process.

A growing group of companies are committing to net positive goals. Coca-Cola Enterprises, for instance, plans to "recycle more packaging" than it uses by creating transformative partnerships to enhance their reach and change consumer behavior. One such partnership is with OpenIdeo, an online innovation platform that leverages the power of a global online community to solve

environmental and social problems. In the case of Coca-Cola, this community has been tasked with developing leading edge ideas to encourage at-home recycling habits.

Ten years ago, the notion of major brands committing to restorative business practices was considered radical — a theory promoted by ecological economists and NGOs as opposed to a business strategy embraced by the world's biggest brands. Altruism isn't driving this evolution. It's a realization that reducing harm isn't enough. The truth is we are running dangerously low on natural resources and playing a self-destructive game with the limits of our planet. My advice? Don't stop when you hit the sustainability ceiling within your organization. Find a way to break through.

Developing Sustainable Packaging Solutions

It is important to take a holistic view of the whole supply chain and how the packaging contributes in sustainability terms throughout its journey from raw material to consumer and recycling. As a packaging material, PET is light, safe, strong, requires much less energy to manufacture than some packaging materials such as glass and is also 100% recyclable. In discussing what is meant by a sustainable package, it is important to understand that its primary function must be to protect the goods, food or beverage it contains and deliver it safely to the consumer, surviving all the challenges of the supply chain. According to Nicholas Bloch, Executive Vice President of Sidel said it is beyond that, sustainability considerations include a number of factors, such as:

• Minimising the environmental footprint of the package through reducing the use of raw materials and other resources.

• Reducing energy use or adopting renewable energy sources, especially during production and transportation.

• Building recycling principles into the design stage.

• Incorporating recycled content in the packaging.

• Adopting end-of-life options, including recycling

Transportation

Transportation of the product, particularly if it involves long journeys, is an important issue. The focus on light weighting in the beverage packaging industry is about reducing the amount of raw

materials used and therefore also the cost. It is also about lowering the costs and the environmental impact of transportation. Compared with glass bottles, for example, a truckload can contain up to one third more PET bottles because they are light and can utilise the full space of the truck without overloading.

Light weighting

Light weighting quite rightly continues to be a prime focus for the beverage packaging industry whereby the amount of raw material required to produce a PET bottle is reduced through the bottle design process. A two-litre PET water bottle that weighed 68 grams in 1980 now weighs as little as 42 grams, with the average weight of a single-serve 0.5 litre PET water bottle down to 9.9 grams – nearly half of what it weighed in 2000. Such a reduction in packaging content offers environmental advantages on two fronts: firstly, the savings achieved in the PET resin raw material itself and, secondly, further reducing the impact of transporting the bottles throughout the supply chain.

Consumer buying behaviors

Awareness of packaging is at an all-time high, with a common concern for consumers being the amount of packaging used. Consumers, along with the retailers, want to know where their beverage products are coming from and how they are produced – they want recycling, recycled material and like the idea of declared recycled material. Consumer groups have been vocal in their demands for the beverage industry to reduce their environmental footprint by cutting down on packaging and using more recycled content.

What's next for PET?

An area in which much research and development is focused is how PET bottles can be created from organic agricultural by-products. The fact that they are by-products and do not incur any food wastage or the additional use of farmland is an important factor given the increased pressures that the growing global population is already bringing in terms of food production. The resulting material is known as Bio-PET, which can also be mixed with PET and R-PET (recycled PET) to produce 'Mixed PET', further extending the recycling opportunities.

Between a quarter and a third of all domestic waste is packaging: much of this is food packaging. It's difficult to recycle, too. Plastic which is contaminated with food is hard to reuse. Packets are often made up of several different layers laminated together (e.g. the card, plastic and foil of fruit juice cartons), which makes them impossible to recycle. The packaging industry argues that packaging is necessary for health and hygiene and has made efforts to make packaging much lighter and thinner (which means that it takes less resources to make and less energy to transport), but the amount of packaged convenience goods on offer is increasing all the time. Packaging and transport are the two biggest environmental problems with convenience drinks. The two are tied together, as heavier containers take more energy to transport and even recycling and refilling demand transport for the empties.

Comparing different packaging systems is fantastically difficult. Attempts have been made to compare plastic with glass, or returnable bottles with disposable ones. The results of such studies are very controversial, with those funded by environmental groups typically coming to one conclusion and those funded by industry coming to the opposite conclusion. The packaging industry claims it is greener now than it was because packets and bottles have become lighter, which means fewer raw materials used and less energy used for transport. However, flimsy, disposable packaging also means lower costs for the producers, as well, and it's hard to be sure that their motives are entirely altruistic.

Overall, the problem is that packaging is driven by the desire to promote brands and to make money, not by the desire to meet real human needs or by the desire to protect our environment. Faced with such a system, the best we can do as individuals is to minimise our consumption of packaged products – even healthy, organic ones! – and to use whatever recycling facilities are currently available.

- **Returnable glass bottles** seem to be the best environmental option – provided transport distances for this heavy material are not too far. The traditional glass milk bottle, increasingly under threat, is a classic example of a system that works.
- **Glass bottle banks for recycling** are now ubiquitous in the UK – and the material collected really is reused. The average glass bottle contains over 25% recycled glass. Green glass bottles manufactured in this country contain at least 60%, and sometimes as much as 90%, recycled glass. In 1997 425,000 tonnes of glass were recycled in the UK – some of this was made back into bottles and jars, but many other products are possible, from fibre-glass to building aggregate.
- **Recycling aluminium drinks cans** is well established in the UK, and supporting this is a must for green consumers. Twenty recycled aluminium cans can be made with the power it takes to manufacture brand new one. Recycling 1kg of aluminium saves 8kg of bauxite, 4kg of chemicals and 14kwH of electricity.
- **Plastic drinks bottles are also recyclable** – and collection services and plastic banks are slowly being setup in the UK. Different kinds of plastic have different properties and different potential for recycling. Some are made from toxic PVC–best avoided altogether. PET is fully recyclable – from old bottles back to new bottles – and can also be reused to make consumer goods from fleece jackets to furniture.

Avoid excess packaging

- Try to avoid buying lots of packaging – you may be able to get fruit and vegetables packed only in paper bags, rather than on plastic or polystyrene trays.
- Buy food and drink in recyclable packaging such as glass jars or tin cans

- If you have storage space, buy dried goods in bulk – this means fewer individual packages.
- Buy basic ingredients and cook them yourself, rather than small prepackaged portions.
- Organic fruit and veg. in supermarkets is often highly packaged – because it is marketed as high-value luxury produce.

How to make packaging more sustainable:

Five (5) ways companies are making packaging more sustainable

The conversation centered on the many ways companies are working to make packaging more sustainable. These five methods stood out.

Life Cycle Approach

What is an LCA?

An **LCA** is a standardized, scientific method for systematic analysis of flows (e.g., mass and energy) associated with the life cycle of a specific product, technology, service or manufacturing process system. In the case of a product system, the life cycle includes raw materials acquisition, manufacturing, use and end-of-life (EoL) management. According to the International Organization for Standardization (ISO) 14040/44 standards, an LCA study consists of four phases:

1. Goal and scope (framework and objective of the study);

2. Life-cycle inventory (input/output analysis of mass and energy flows from operations along the product's value chain);

3. Life-cycle impact assessment (evaluation of environmental relevance, e.g., global warming potential); and

4. Interpretation (e.g., optimization potential).

Sustainable packaging is more than a single metric or strategy; it is a life cycle approach that focuses on consumption and emission factors starting with initial design and continuing through end of life. Using life cycle assessment can identify hotspots for improvement in a package and prevent shifting the burden of a packaging's impacts. GreenBlue announced a simplified COMPASS (Comparative Packaging Assessment) Life Cycle Assessment tool that allows companies to compare packaging options. The latest version of COMPAS presents the largest addition to the tool to date, with the inclusion of transport, or tertiary packaging to round out its assessment.

Consider the package and product relationship

You can't have one without the other. Packaging delivers products, prevents spoilage and communicates essential information to consumers. A package that is not right for the product

might result in product spoilage or over-packaging. Companies are focused on correct sizing and material selection to best fit and deliver their products in the most efficient way.

Choose effective sustainability labeling and marketing

Effectively communicating sustainability is an important part of developing sustainable packaging, especially to ensure consumers understand how to treat a package at its end-of-life. Companies are looking for ways to make meaningful and accurate claims that resonate with consumers. This includes clearly communicating recyclability and sourcing information. Companies are going beyond compliance with the US Federal Trade Commission's Green Guides to employing claims that drive action and positive consumer response and to help ensure that packages are treated in a way that increases recovery. The Sustainable Packaging Coalition (SPC) is harnessing this trend through its How2Recycle label and Meaningful Marketing Claims leadership committee projects. The How2Recycle label was created to provide consistent and transparent on-package recycling information to consumers, in order to better communicate what can be done with a package at its end of life.

Get creative

Experts across all levels of the packaging industry are getting creative in their work to make packaging more sustainable and also in looking for their next innovation. At the members meeting and forum, industry experts shared some ways they are working to bring sustainable packaging to the next level at their companies and organizations. A wide range of ideas, such as research on removing full body shrink labels, biomaterials, sourcing and new opportunities for end-of-life solutions are now under wide discussion.

Talk with others

Companies are increasingly collaborating with NGOs, industry associations, working groups and other companies to come up with new ideas in packaging sustainability. Conversation involves connecting actors throughout the supply chain to work together to solve problems through research and sharing best practices, which is at the heart of the Sustainable Packaging Coalition. By bringing companies, educational institutions and government agencies together in one place, the SPC and the Sustainable Packaging Forum were able to get this diverse set of actors to start talking about the new frontier of sustainable packaging.

Green Packaging

What is Green Packaging?

Green packaging is not just about reducing the amount of packaging but takes package design, processing, disposal conditions and the entire product lifecycle into consideration. Some of the characteristics of sustainable packaging include:

1. Minimizing the amount of packaging used (weight and volume)
2. Minimizing the energy used for production and transportation of goods
3. Using packaging that can be reused again, such as bottles and refillable ink cartridges
4. Using recycled and recyclable materials
5. Using biodegradable materials

Businesses are investing in green packaging because consumer research has shown that consumers value sustainable packaging provided that other aspects of packaging like functionality are met.

The Cradle to Cradle Approach

Cradle to Cradle Certification is carried out by McDonough Braungart Design Chemistry (MBDC) consultants. The cradle to cradle concept holds that it is possible to have products that follow the natural principles of regeneration and create zero waste products. Each product is believed to consist of 2 components the technical nutrients and biological nutrients. The technical nutrient can be reused without degradation into an inferior product while the biological nutrient is returned to nature at the end of its useful life. Besides being earth friendly, this approach can lower costs for organizations and do away with the need for landfills.

Different Types of Sustainable Packaging

Sustainable packaging is made of recycled products, recyclable products, biodegradable material and renewable raw materials. Some types of sustainable packaging products are described below. The list is indicative and not exhaustive.

Packaging made out of recycled source material

- **Paper** – is light weight, easy to print and can be recycled multiple times by using relatively little energy. However, the chemicals used to bleach paper may not be environmentally friendly and the replacement of forests by monocultures reduces biological diversity. Unbleached, post consumer waste paper is the best.

- **Glass** Uses the least energy per pound to recycle. Additionally it is chemically inert and can be recycled almost infinitely without degrading. The disadvantage is that it is heavy and breakable.
- **Aluminum** Is easy to recycle and can be molded to almost any shape. On the flip side mining for aluminum ore and aluminum manufacture are highly energy intensive processes.

Synthetic biodegradable polyesters

These advanced materials are moisture resistant, and disintegrate in 12 weeks under aerobic conditions. They are often used as a coating for protecting cheaper biodegradable materials. The biggest problem in the popularizing of this product is its high cost. Also the facilities for sorting and composting may not be easily available in North America.

Packing products made of corn starch and other annually renewable plants

Grasses like bulrush are used to provide pulp for manufacturing paper substitutes for packaging. Corrugated boxes made of sugarcane fibers are another example of sustainable packing material.

These are hardy, easily renewable and are easily recyclable. Some of these packages may not have the strength needed for specialized applications or stacked storage or they may be permeable to water. Coating the package with synthetic biodegradable polyesters or pairing them with recyclable or recycled PET increases their performance characteristics.

Five (5) ways of making packaging greener

1. **Reduce packaging:** The ideal packaging is no packaging. Reduced packaging translates to cost savings in material costs, transportation and disposal.

2. **Recycled material is better than recyclable products:** A recyclable product may or may not be recycled. A recycled product on the other hand has been recycled and therefore has a smaller ecological footprint.

3. **Use Biodegradable materials:** Biodegradable plastics and polyesters are available and so are paper containers, paper nuts, etc.

4. **Do not mix products that are incompatible for recycling:** If two or more polymers are used in making a package it may not be possible to recycle the package. If you must use plastics try to stick to one single plastic so that it is easy to recycle.

5. **Design packages with other functional attributes:** A food container shaped as a toy or a puzzle box that can double up as an ornament store can ensure that packaging does not end up in landfills.

Choose the right partner – Green your packaging:

1. **Be Green Packaging**

Be Green Packaging LLC is based out of Santa Barbara. The company provides cradle to cradle certified, compostable packaging made from bulrush an annually renewed plant. These packages are free from tree products and are made from bulrush plants harvested from the wild and not cultivated commercially. The impact on the biodiversity of the planet is therefore minimal. Some of the products that need a cover have been provided with clear 100% recyclable PETE lids.

2. **Green Cell Foam**

Green Cell Foam provides coolers and other packaging solutions made from corn. These can be easily composted, recycled or burnt safely. The natural material has been used by Pharmaceutical companies like Sandoz, computer manufacturers and automobile manufacturer. Volvo to minimize their environmental impact. The product is used for transporting heavy items like windshields on one hand and delicate play station games on the other.

3. **Green packaging**

Green packaging offers a wide range of products like recycled corrugated boxes made of 100% post consumer waste, inflated air pillows made of 100% recycled plastic, Prairie eco pak a filler made of recycled corrugated boxes, water soluble loose packing peanuts made of corn starch, loose filling paper nuts made of post consumer and post industrial recycled waste, biodegradable poly bags and poly bags with up to 50% recycled polyethylene.

4. **Globe Guard Products**

Globe Guard Products supplies reusable boxes, 100% recyclable poly padded paper, corrugated mailers made of 100% recycled material, post consumer waste recycled paper labels, Oxodegradable stretch film, eco friendly cushioning products and even gift bags made of treeless paper. Green Packaging is available for almost every application.

Green is good. No one doubts that anymore, and with that fundamental shift in social moves and consumer expectations, sector after sector of the economy has been undergoing transformations including energy, agriculture, transportation, housing. Sustainable packaging is now a $27 billion market, growing at nearly 4% annually across three distinct segments: reusable's, recyclables and degradables. Recycled (and recyclable) paper and plastic are the vast majority of the sustainable market and will continue to be so for some time, benefitting from consumer familiarity and a well-developed recycling infrastructure, but the landscape is changing. Degradable and compostable containers molded from plastic, wood and non-wood-fibers are making critical inroads, with quick service restaurants (QSRs) leading the way. Consumer Packaged Goods (CPGs), while lagging QSRs, may have the greatest long-term growth potential with these types of packaging. The trend is accelerating, and not just because we all agree it should, or even because the regulatory system increasingly says it must. These days, sustainability is cool, a fact that brand owners, converters, packagers, retailers, investors—anyone with a stake in understanding what ultimately drives consumer spending can't afford to ignore. Among the key drivers are:

• **The halo effect:** Environmental consciousness has gone mainstream, and the ripples are being felt throughout the sustainable packaging sector by consumers, increasingly aware of the power they have to express green values and promote a green agenda through the buying choices they make; by marketers who want to build a compelling brand story around sustainability.

The development of the degradable market—including innovations like wood and non-wood degradable molded fiber, starch-based and photodegradable plastics and others—may translate into growth that comes at the expense of traditional paperboard and plastic pellet product lines. Converters who fail to innovate in anticipation of evolving demand will ultimately lose business.

• **Raw material suppliers:** As it is with converters, the coming degradable packaging revolution is both a challenge and an opportunity. Fast changing market conditions will favour those with broad product lines that include degradable resins as well as wood and non-wood fibers. The Next Green Frontier for many consumers, sustainability is no longer simply a lifestyle option;

it's an important choice they feel they can make to protect the environment for the sake of future generations. That's a powerful consumer motivator. Meanwhile, producers, packagers and retailers around the world face growing regulatory and channel pressure to comply with sustainable packaging standards

Green Packaging Market - Industry Analysis, Trend, Size, Share and Forecast 2015 – 2021

The green packaging market across the globe is expected to experience a stable growth from 2015 to 2021. Green packaging alternatively known as sustainable packaging market is segmented on the basis of application, packaging type and geography. The packaging type is further bifurcated into recycled content packaging, reusable packaging and degradable packaging. The various categories of recycled content packaging are paper packaging, plastic packaging, metal packaging and glass packaging among others. The reusable packaging is divided into drums, plastic container and others. On the basis of application the green packaging market has been segmented into food and beverage packaging, personal care packaging, health care packaging and others. By geography, the green packaging market has been segmented into North America, Europe, Asia-Pacific and Rest of the World (RoW).

Increasing environmental concern is one of the major factors fuelling the demand for green packaging globally. Owing to this factor, considerable efforts are being made for reduction of toxic waste emissions. Green package results in very less toxic emission and causes less pollution in the form of landfills. Consequently, there is an increasing demand for green packaging to keep the environment clean and pollution free. Moreover, owing to increase in government's initiative to clean the environment, strict regulations are formulated by governments globally. Manufacturers are now under pressure to use eco friendly material in packaging and adopt methods that have less adverse impact on environment. Consequently, many industries have to adhere to green packaging as a part of their Extended Producers Responsibility (EPR). This factor is also boosting the market to a great extent. In addition, the use of green packaging gives competitive advantage to industry over other market players since consumers prefer products having sustainable packaging over others. Owing to this factor, the demand for green packaging is increasing and expected to grow rapidly during the forecasted period.

Disadvantages of GP:

However, reduction in profit margin due to increase in production cost is one of the factors restraining the growth of green packaging market. In addition, limited consumers demand due to lack of awareness regarding green packaging among consumers also limits the industries to switch to green packaging. However, government is taking initiative to make people aware of the importance and benefits of green packaging. In spite of these restraining factors the green packaging market will stand firm during the forecasted period.

In the green packaging market, among application segment the food and beverage packaging held the largest market share. Food and beverage industries are the largest consumer of green packaging. As the demand for eco-friendly packaging increases among consumers the manufacturers of food and beverage products have started adopting green packaging for their products.

The U.S is the largest market for green packaging because of the extensive use of eco-friendly packaged products. Asia-Pacific region especially India and China offers the fastest growing market for green packaging. The population of the Asia Pacific region is large and growing considerably. The increasing population accounts for a better consumer base in this region. Food and beverage industry which constitutes the basic necessities of the growing population has better opportunity in this area and is emerging as the largest market for food and beverage in the near future. These food and beverage industries use green packaging to a great extent for packaging their products.

Thus, developing economies of Asia Pacific are expected to experience a decent growth in the demand for green packaging products during the forecasted period. North America and Europe are the matured markets for green packaging and is expected to have a healthy growth in recent years.

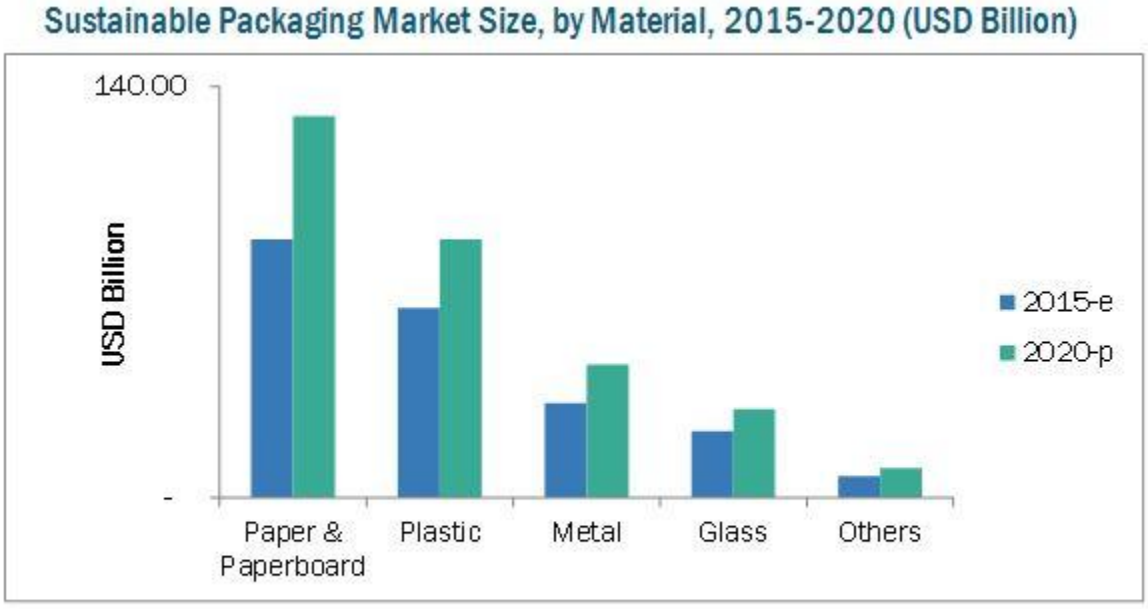
A new Transparency Market Research report states that the global green packaging market was valued at US$132.4 bn in 2014 and is predicted to reach US$203.1 bn by 2021. It is expected to rise at a CAGR of 6.20% between 2015 and 2021.

As per the report, the green packaging market is majorly stimulated by the rising health awareness amongst consumers. Consumers have become more health-conscious and there is a shift in preference towards biodegradable and healthy packaging. This has raised the demand for green packaging owing to its health benefits. Furthermore, rising environmental concerns are also fuelling the demand for green packaging on a worldwide level, as green packaging causes very little environmental pollution. Additionally, the shortage of natural resources has also played a major part in raising the demand for green packaging owing to the fact that green packaging can be easily recycled. The rise in initiatives taken by various governments for keeping the environment pollution-free and clean has also boosted the market.

On the other hand, lowering of the profit margin owing to a rise in production cost is amongst the key factors impeding the development of the market for green packaging. Furthermore, the absence of awareness amongst consumers has lowered the demand for green packaging and has held back some industries from switching to green packaging. Nonetheless, a number of government initiatives have been taken to overcome these issues and the market for green packaging is poised to rise through the forecast horizon as a result. The report segments the green packaging market in terms of packaging type, applications and geography.

On the basis of packaging type, the green packaging market is segmented into reusable packaging, recycled content packaging, and degradable packaging. The reusable packaging segment is further segmented into plastic containers, drums, and other reusable packaging. The recycled content packaging is further segmented into plastic, paper, glass, metal, and others.

The rising population base in Asia Pacific leads to a rising demand from the food and beverage industry, which utilizes green packaging for packing products. The sustainable packaging market is estimated to reach USD 303.60 billion by 2020, with a projected CAGR of 7.17% from 2015 to 2020. Growth in the packaging industry globally and strict regulations regarding sustainability have fuelled the growth for sustainable packaging. The food & beverage packaging segment has the largest application of sustainable packaging, especially in emerging markets such as China, Brazil, and India. The sustainable packaging market depends on various players who provide technological solutions for sustainable and eco-friendly packaging. The market in this report is segmented on the basis of material, process, function, layer, application, and region.



E - Expected, P - Projected

Source: Expert Interviews and MarketsandMarkets Analysis

The paper & paperboard segment is projected to grow at the highest CAGR of 8.08% from 2015 to 2020. The key players of the sustainable packaging market implement different strategies such as expansions, agreements, contracts, joint ventures, and partnerships to gain a larger share in the market. The sustainable packaging market is a highly fragmented one. Major companies rely on regional and local distributors to increase their share as well as geographical presence in the market. One of the major developments observed in the sustainable packaging market is mergers and acquisitions. Companies are adopting organic growth strategies such as new product developments to cope with the increasing demand for sustainable packaging solutions in emerging markets. These strategies have aided companies to create a large customer and partner base in these markets.

2012 Survey of Future Packaging Trends

Two key trends that most impact packaging work today and the two trends that will have most impact on the packaging industry ten years from now.

Overall: Respondents say cost is the top factor driving the industry today (59%) but they predict it will fall significantly in importance in 10 years (dropping 28%) to below factors like sustainability (51%) and food safety/security (37%). North American respondents selected performance (40 percent) as the second most important trend, while European respondents emphasized food safety/security (44 percent)

Future trends in Europe are sustainability (53 percent) and food safety and security (40 percent)
Future trends in North America are sustainability (48 percent) and cost (41 percent). Though they didn't rank among the top three trends "affordable technology" and "convenience features" held the same level of importance today and in 10 years (30% each in both time periods).

Verbatim Responses: More than 450 respondents wrote-in their thoughts about the one trend that will have most impacts on packaging in 10 years. Comments about sustainability, cost/affordability and food safety and security dominated.

The trend will have most impact on packaging ten years from now.

Respondents were asked to agree or disagree with the following statements:

Regulations will influence packaging design more 10 years from now

Packaging will play a more important role in a product's success 10 years from now

Plastics will continue to replace metal and glass packaging

Flexible structures will continue to replace rigid packaging structures

Recycling concerns will hinder use of packaging structures containing more than one type of material

Overall Respondents see:

A future where packaging plays a more important role and where regulations will play a more influential role.

Flexible packaging continuing to replace rigid packaging structures. Plastics continuing to replace metal and glass.

When evaluating sustainable packaging, picked the two criteria value most today and then in 10 years.

Overall: Cost matters most (75 percent) when it comes to evaluating sustainability in packaging today, but falls to the third most important criteria (41 percent) overall in 10 years. Lifecycle analysis (52 percent) and recyclability of the package (46 percent) will be the two most important criteria overall in 10 years. The source of raw materials will become increasingly important (from 20 percent today to 40 percent in 10 years) to tie with cost as the third most important criteria in 10 years.

Two packaging attributes are important to consumers today and then two packaging attributes will be important to consumers in 10 years.

Overall: The packaging industry today clearly thinks that consumers value convenience (76 percent) and shelf appeal (58 percent).

In 10 years, respondents think this dynamic will completely change, with consumers valuing sustainability features, specifically perceived "greenness" of the materials (increasing 23 percent), recyclability (increasing 27 percent) and reusability (increasing 13 percent).

The global green packaging market has been segmented as follows

By Application:

- Food and Beverage Packaging
- Personal Care Packaging
- Healthcare Packaging
- Other Packaging

By Packaging Type:

- Recycled Content Packaging
  - Paper
  - Plastic
  - Metal
  - Glass
  - Other
- **Reusable Packaging:**
  - Drums
  - Plastic Containers
  - Other Reusable Packaging
- **Degradable Packaging:**
- **By Geography:**
  - North America

- Europe
- Asia-Pacific
- Rest of the World (RoW)

Solidus Solutions Developed BioBoxx

BioBoxx has developed a biodegradable solid board box in collaboration with Solidus Solutions to replace green waste containers. BioBoxx approaches organic waste management with a distinctive and innovative vision with this new product. The BioBoxx is an outstanding replacement for the more traditional collection of green waste, for example. 'The BioBoxx's sustainability lies in its lower environmental taxes, together with a sharp reduction in regular waste disposal costs (emptying, cleaning and disinfecting', explains co-founder Hans Govers. BioBoxx is a new concept underpinned by the biobased economy. The boxes, made from recycled paper and filled with green waste, allow the box and its contents to be processed together. A BioBoxx is produced from solid board with a water resistant coating, and has a patented folding system which ensures the box remains leak free. Makes sense, as the BioBoxx can be industrially (anaerobic) fermented together with green waste. So this is a one-time only packaging. The BioBoxx is fermentable and compostable. Fermenting the box also produces energy. This means that BioBoxx has a considerable part to play in reducing CO2 emissions and contributes to Corporate Social Responsibility. In addition, the many possibilities for use by both business and consumers ensure a big step forward in the further integration of 'climate neutral' entrepreneurship within current operations.

Major Initiatives for Sustainable Packaging:

Tetra Pak Launches 2015 Sustainability Update:

Tetra Pak has launched its 2015 sustainability report, which highlights the company's achievements in environmental performance, social responsibility and good governance over the past year. Examples of Tetra Pak's progress in sustainability include:

• The Tetra Rex Bio-based carton hited the shelves in January 2015 as the world's first fully renewable package manufactured solely from materials derived from plants.

• In June, the revolutionary Tetra Pak E3 was launched, a filling machine that uses electron beams, rather than hydrogen peroxide, to sterilise packaging material, which results in significant energy savings and reduced environmental impact.

• The company has made good progress on implementing a global operational health and safety (OHS) management system. The target is to achieve OHSAS 18001 certification for all of Tetra Pak manufacturing sites by the end of 2016. So far 50% have been certified, which is up from 42% in 2013.

• Tetra Pak maintained its support of Dairy Hub projects in Bangladesh, Kenya, Nicaragua and Sri Lanka in 2014 and began a new project in Senegal in early 2015. Through these projects, the

company helps to secure long-term supply of locally produced quality milk in developing countries. During the past year, as a result of Dairy Hubs, particular progress has been made in Bangladesh, where the dairy farmers' average net monthly income has reached $245, up from $70-90 in 2012.

• Tetra Pak's Food for Development team continued its support to governments and customers all over the world to implement school feeding programmes. In 2014, 66 million children, a record high number, received milk or other nutritious drinks in Tetra Pak packages in schools.

• During the first quarter of 2015, Tetra Pak's Deeper in the Pyramid (DiP) unit launched more than 20 new products designed specifically for the low income consumer segment in over 10 countries, while increasing the number of packages sold by 12%, compared to the same period last year.

"At Tetra Pak approach to sustainability derives from brand promise: PROTECTS WHAT'S GOOD. That means protecting food, through processing and packaging activities. But it also means protecting people, both inside and outside the company. And it means protecting futures: planet's, customers' and own.

Since it has been realized for long the importance of balancing each of these commitments and that the only way to achieve this is through collaboration, innovation, determination and a strong sense of obligation across the entire company. With the announcement of the UN 2030 Sustainable Development Goals, sustainability will be an area ever more integrated into the activities of companies worldwide. Companies should be committed to working with customers to meet the challenges that the UN has set out.

As part of Tetra Pak's annual Communication on Progress (COP), a condensed version of the report has been submitted to the UN Global Compact, which demonstrates how the company is integrating the 10 principles on environmental performance, labour and human rights practices, and anti-corruption into its business strategy and day-to-day operations.

Sustainable Packaging Trends:

Sustainability to Demonstrate Packing in ten years

Sustainable packaging is the development and use of packaging which results in improved sustainability. This involves increased use of life cycle inventory (LCI) and life cycle assessment (LCA) to help guide the use of packaging which reduces the environmental impact and ecological footprint. Sustainability will replace cost as one of the packaging industry's major challenges within 10 years, according to a study conducted by Packaging World and DuPont.

In the 2012 Survey of Future Packaging Trends, 59 percent of respondents said cost is the top factor driving the industry today. The study, which surveyed 500 industry professionals, indicated cost would fall 28 percent in terms of importance, below factors like sustainability at 51 percent and food safety and security at 37 percent, in the next 10 years in both Europe and North America. Respondents also said food safety concerns due to climate change and agricultural issues would impact the packaging industry 10 years from now.

Consumers will put a greater value on recyclability and the perceived "greenness" of packaging in 10 years, the survey found. The public will also increasingly demand proof of sustainability claims, such as lifecycle analysis data.

Some 82 percent of respondents said regulations will have a greater influence on packaging design in 10 years; and 65 percent agreed that plastics will continue to replace glass and metals. Some 65 percent of respondents also said flexible packaging will continue to replace rigid structures.

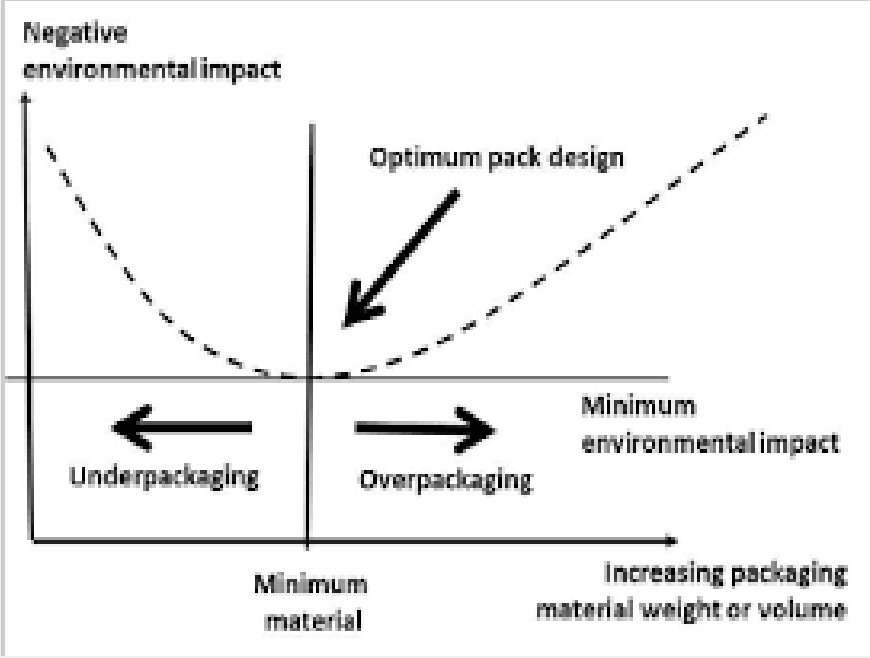
For industry professionals evaluating sustainable packaging now, 75 percent indicated cost matters most, but falls to the third most important criterion (41 percent) overall in 10 years. In 10 years, lifecycle analysis (52 percent) and recyclability of the package (46 percent) will be the two most important criteria overall when evaluating sustainable packaging, respondents said.

In related news, Deloitte released a paper "Thinking Outside the Box: Throw Away Your Current Approach to Packaging," which explores how companies can improve product stewardship, achieve waste-reduction goals, and save money through packaging. The report examines challenges of achieving improvements in packaging and discusses some examples of innovative new packaging value chains. The report also suggests in order to effectively implement sustainable packaging changes, companies should consider following certain practices, starting with life cycle assessment of the environmental impact of the current packaging. They should follow this by adjusting ongoing supply chain planning and should balance multiple design criteria to ensure that sustainable packaging meets transportation, retailer and customer needs.

Zero Waste

The 'Zero Waste' puzzle: one more piece in place

Pioneer of fresh full service recycling solutions for release liners Cycle4Green is continuing its enthusiastic focus on supporting customers with its 'zero waste' programme. Established in 2009 with the promise of closing the loop for the label liners, pioneering recycling specialist Cycle4green is still bringing its forward-thinking liner recycling solutions to new customers. Dedicated to providing practical recycling programmes for customers using silicone-coated liners across Europe. An independent company with a resolutely 'open service' provided for the benefit of the customer and the environment, Cycle4green is continually developing and introducing new service models to further boost its offer for a large variety of customers in label converting and label end-use markets.



Making liners greener

We know that recycling is far better for the environment than incineration as the carbon footprint is reduced, not to mention the benefits of lowering consumption of virgin raw materials in products. The sector has a great deal of work to do to inform potential customers of our impressive liner recycling capabilities, so we're keen to talk to companies that are currently generating waste and want to reduce it.

Closing the loop

Collected waste is processed by using a novel technology which enables the re-use of fiber in label liners in an economically effective way. Recovered paper fibers are used in the production of 100 per cent recycled label paper products which can be used in original end-uses. Thus the recycling loop is fully closed. Several partners in the label converting industry are actively either promoting or setting up collection programmes themselves which shows their willingness to embrace sustainability through responsible waste management towards integrated sustainability.

Waste reduction and responsible handling of waste are important elements whenever goods are being manufactured and packages used to protect them. Both of these processes need to be measured and optimized internally during manufacturing as well as in combination with effective partners in waste management.

But there is still a great deal to be done in the drive towards developing ecologically sustainable products and packages. The selection of the most appropriate materials to fit each specific case is of paramount importance. In the case of paper there are some important factors to be borne in mind, such as responsible sourcing through FSC certification, quality and environmental standards as well as the use of renewable raw materials with a naturally low CO2 impact.

Solid Growth in Folding Cartons

According to the report, spending on alcoholic beverages is expected to be robust over the next five years, as consumers trade up to more premium options such as craft beers and select wine and spirits. The Trends Report also predicts that the dry foods market should experience steady growth as consumers purchase more healthy, yet more expensive products (e.g. gluten-free, whole wheat, organic) as well as more frozen fruit, a bump caused by an increased interest in smoothies and homemade juices.

However, as a growing number of health-conscious consumers look for fresher, more nutritious alternatives, sugary drinks and the frozen foods market will not fare as well. The Trends Report also predicts a bright future for the pharmaceutical market, as aging baby boomers, new drug development and expanded healthcare insurance coverage boost spending. As rising personal incomes increase discretionary spending on premium goods over the coming years, beauty and cosmetic markets are also expected to fare well. This year, the Trends Report also forecasts solid growth for the folding carton market. Even with pressures from plastics and other alternative substrates, the folding carton market is expected to grow 0.5% through 2019, and the total value of U.S carton shipments should climb to $9.5 billion over the same period. Additionally, average values per ton are expected to increase 0.8% annually for the foreseeable future.

Furthermore, boxboard prices—which have been increasing over recent years—will begin to fall as increased coated carton board capacity from China continues to spill over into the global marketplace. Bleached board prices will also be undermined when substantial boxboard tonnage comes online from Europe next year.

Mondi Launches PERGRAPHICA Design Paper

Mondi has launched PERGRAPHICA, a new portfolio of premium uncoated fine papers designed for the exacting needs of the creative and commercial print industries. The PERGRAPHICA portfolio provides excellent printability on a choice of textures, shades and weights. It is called ‘Paper for Perfectionists’ because it fulfills the most demanding requirements for sophisticated and elegant printed documents. Graphic designers, advertising

agencies and fine book publishers are just a few of the creative industries that will appreciate PERGRAPHICA's variety of options: two textures (Rough and Smooth), three shades (High White, Classic and Natural) and six gramms between 90 and 300 g/m2.

Key Findings: Poised on the brink of change

Sustainability concerns, ranked behind cost and food safety/security as today's driving trends, will dominate packaging industry work in 10 years in both Europe and North America. Cost, today's top driver, drops in importance in 10 years. Food safety/security remains a top factor driving packaging work. Today's emphasis on "right-sizing" gives way to strategies to use renewable materials, recyclable materials and smart packaging in 10 years – a clear call for innovation and collaboration throughout the value chain. Though rarely selected as a "top" trend, convenience factors are identified as very important today – and that importance is expected to be maintained in 10 years.

Maximum value. Minimal Impact.

The packaging industry believes consumers will have increased value for recyclability and perceived "greenness" of packaging in 10 years – at the same time, demand for proof of sustainability claims will grow exponentially, for instance in the demand for life cycle analysis data. Right-sizing packaging in terms of efficient package shape/size, down gauging of package material and minimizing package failures dominate both the North American and European packaging landscape today. Materials play a critical role in these objectives. Plastics will continue to replace glass and metals and flexible packaging will continue to replace rigid structures.

Two underlying issues are important to note.

• Whilst it is the case that other sectors, such as construction, contribute proportionally more waste by weight to the solid waste stream; the debate is moving away from focusing on the proportion of waste arising by weight to a more relevant understanding of the specific environmental impact of each material in the waste stream. For example, a card and paper-based packing solution may be lighter than a plastic-based one, but the disposal of card and paper in landfills leads to the formation of methane which, in turn, contributes to global warming.

• Packaging makes up a much more significant part of household waste. For example, in the UK, packaging accounts for between 15% and 25% of solid municipal and household waste by weight. As per estimates household packaging waste generated in Bangladesh consists of 5% paper, 2.6%, metals, 2% glass and 4% plastic. The bulk of this is disposed off at refuse dumps where they are burnt, left to degrade or deposited in landfills. Unfortunately poor management of plastic waste has resulted in a lot of litter resulting in a bad image for plastics as packaging material. Uncontrolled littering has drawn the attention of government to introduce legislation to control the impact of waste on the environment.

Legislative changes

With the EU landfill directive requiring local authorities to reduce biodegradable municipal waste sent to landfill in 2013 by 50% (from a 1995 baseline), it is likely that local authorities will impose ever more stringent requirements on households to sort and re-cycle their waste in an effort to avoid the financial penalties for not meeting these targets.

The challenges to the packaging industry

'Fast-moving consumer goods manufacturers (FMCGs) and retailers should look at the process as a whole, not just at the packaging element. The sustainability impacts are often far higher in the processing of the product or even in its end use, than in its packaging.' Given this, how much more active are consumers likely to become in the packaging debate if they begin to believe that 'excess packaging' is the reason why they have to pre-sort and recycle their household waste, or in extremis, if they should find they are being charged directly for waste collection?

How Green Is Your Business? - A self assessment

Whether you're trying to save money, attract new customers and clients, or make your business a better place to work, implementing sustainable business practices can help. That's especially true if your target customers or employees are Millennials. This age group cares more than any other about sustainable business practices, according to a new survey. About two-thirds (62 percent) of small and midsize businesses in the second annual Cox Conserves Sustainability Survey have implemented sustainable business practices such as conserving energy and resources—a figure that's pretty much unchanged from last year. The top five ways those small and midsized businesses are supporting sustainability:

1. Using supplies efficiently, such as printing on both sides of paper (62%)
2. Using energy-efficient lighting and equipment (60%)
3. Offering paperless (56%)
4. Offering recycling programs (54%)
5. Holding meetings virtually (45%)

Among the top benefits of sustainable business practices are cost savings (cited by 46 percent), demonstrating a commitment to the environment (40 percent), and enhancing the company's public image (38 percent). So what's holding small and midsize businesses back from becoming more environmentally friendly? Unwillingness to pay higher upfront costs for sustainability is a key factor, as is the fact that other priorities are taking precedence. However, according to Millennials, older generations are also standing in the way. While Millennials know more and care more about sustainability than any other age group and are more committed to increasing sustainability, the Millennia's surveyed say that they don't yet have enough influence in business and management to effect change.

Global Clothing Accessories Industry

The global clothing accessories industry is worth close to $16.5 billion, according to research from Packaged Facts. Spending patterns concerning accessories are slightly different than clothing purchases as accessories are often bought on impulse or as add-on purchases. The world clothing accessories market is expected to exceed $20 billion by 2018. The global clothing accessories market is expected to see growth resume in the post recession period. Consumer confidence is recovering from the lows of the economic recession, with shoppers more willing to splash out on luxury and non-essential items. As consumers become increasingly conscious about the environment, demand for environmentally friendly items are on rise.

Market Outlook

The global clothing accessories industry faces several challenges, including rising prices of raw materials and stricter government and trade regulations. Emerging markets are expected to record strong growth, with Asia-Pacific demand for luxury items and replica rising. Competition from Asia-Pacific continues to threaten US producers, with companies looking to boost quality rather than lower prices to compete.

The industry is heavily reliant on technology, with specific emphasis on improving production by using the most up-to-date machinery. As both purchasing power and standard of living rise, the clothing accessories industry will see its consumer base grow.

Large-scale manufacturers spend 50 percent on fabric and 18 percent on accessories to make a finished garment. In the readymade garments sector, the items other than fabrics are called ‘accessories’. Accessories are as important as the fabric itself. The garment accessories trade, therefore, has flourished worldwide along with the RMG sector. In Bangladesh, the garments sector grew rapidly over the last several years for a lower cost of production, but growth of the accessories industry crystallized later. In the beginning, Bangladesh used to import almost all kinds of garment accessories. But as local companies thrived, dependency on imported accessories gradually subsided. The country initially imported accessories from countries like China, Hong Kong, Singapore, Japan and India, spending a large amount of forex. But now, the country is almost self-sufficient in garment accessory manufacturing, as the ancillary industries blossomed and flourished here, driven by high demand.

Zippers, buttons, labels, hooks, hangers, elastic bands, thread, backboards, butterfly pins, clips, collar stays, collarbones and cartons are the major garment accessories produced in Bangladesh. The use of high-end accessories also adds value to the garment. As a result, large manufacturers and exporters try to use sophisticated accessories to pull in better prices from international buyers. The import of accessories declined sharply as many local companies have developed the capacity to supply quality accessories. Two important industries — accessories and backward

linkage — have flourished in Bangladesh to support the garments sector. Local accessory makers are rapidly going for fully automated production systems from semi-automation modes to meet demand from international buyers.

Environmental Policy

Quite a good number of Accessories Industries have set their Environmental Policy as under:

Generate, set and review the well define achievable objectives and targets through the management review process considering the significant environmental aspects for continual improvement of environmental performance.

Reduce the existing waste level, minimize the degree of contamination and conserve the resources by recycling materials at every stage of the process.

Ensure and provide a safe and healthy working environment for all of the employees who are working in the company.

Engineer and evolve the method of process of product development and production procedures in accordance with the environmental phenomena.

Necessary legal requirements and practices for industry standard relating to Environment should be considered and complied.

Recommendations

For Industry

1. The pressure for more sustainable packaging will increase.

2. In order to influence the developing agenda, the packaging industry needs to become more proactive and develop a consensus on what actually constitutes ‘sustainable packaging’ and how the sustainability of packaging should be measured.

3. The packaging industry has made a poor job of championing the value and importance of packaging. It will need to do more to redress the balance if it doesn't want the popular misconception that packaging is wasteful and environmentally harmful to grow.

4. The industry also needs to articulate more clearly to regulators, nongovernmental organisations (NGOs) and consumers often relatively modest contributor to the overall environmental footprint of a delivered product, and the success that the industry has already had in reducing the environmental impact of packaging.

For management

1. Immediately review your customer base to understand which of them have made public announcements on their commitment to sustainability and begin talking to them about what their pronouncements mean in practice for their packaging needs.

2. Work with the most significant customers to build a common understanding of the trade-offs between the traditional functions of their packaging and their sustainability needs. From this common understanding work with the customer to better align your product offering to them.

3. From your common understanding agree with your customers what criteria (e.g. carbon footprint, energy usage, waste etc) you could monitor and report to them to demonstrate your ongoing improvements on the sustainability of their packaging.

4. Investigate what other market segments you could serve where your packaging technology could legitimately be argued to be more sustainable than the competition. Target the "sustainability aware" customers in these new markets.

5. Include sustainability as a key consideration in your new product development process.

6. Provide your sales and marketing team with both qualitative and quantitative arguments that allow them to place the superior sustainability of your product as a differentiator in their value proposition.

7. Work in collaboration, up and down the value chain, and use techniques such as Life Cycle Assessment (LCA) or environmental input-output analysis to identify value chain hotspots. Consider whether it is commercially advantageous to you or your customers to work with other players in the value chain to address these hotspots and improve the overall sustainability of a product. Be sure that you can quantify any improvement for your customer.

For the Government:

- To give Green Financial Incentives **(GFI)** to the green industry such as Tax Holiday/ Tax Rebate/lower rate of tax
- Subsidizing of Greening Cost to the Industry
- Preferential Treatment of Green Industry for bank loans
- Lower(single digit) interest rate for green industry

- Green Commercially Important Business**(GCIB)**
- Introduction of yearly Industry National Green Award **(NGA)** to Greener Industry, may be top ranking three companies with a gold medal and a certificate of excellence each and a crest with a certificate of merit each to two more companies every year.
- Bangladesh missions abroad may be engaged to market the goods and services of the green companies on priority basis and help boost up the exports of the country by providing green markets information through the EPB around the world.
- Government must slash down petroleum price commensurate with the international crude price now prevailing(US$36/barrel) to bring down general price level. Inflation in Bangladesh now 6.2%, India 4.8%, Pakistan below 3% mainly due to price adjustment of petroleum price in line with the international price. With the unprecedented increase in Government salary and perks the inflation is bound to go up further.

A Vision for Sustainable Packaging

A consensus based definition of the general attributes that sustainable packaging should have includes the following elements:

1. That the packaging weight and volume has been considered and effectively reduced.
2. That waste to land-fill has been reduced through designed-in-recyclability, reusability or degradability of the substrate

3. That the packaging has a lower environmental footprint in terms of resources used in production as well as emissions to air and water.

4. That the packaging effectively reduces waste through extending shelf life and prevents damage or contamination

5. That the packaging is able to communicate effectively and engage consumers as to brand attributes and sustainable credentials.

6. The Faruque concept of "**CHEAPERBETTERSAFERFASTER"(CBSF)** Mathematical Representation of which stands as: **(1/2P+Q2+S2+1/2T=SUSTAINABILITY)** should be followed religiously across the industry sector.

7. Go for Breakthrough Analysis, and get the habit of **Why? Why? Why? And Why? and Why at least for 5 times** although your operational activities

8. Go for Business Process Reengineering **(BPR)** and have an annual or at least bi-annual review by independent/external experts knowledgeable of the complete operational cycle.

As a Boomer myself, I find it surprising that the generation that first focused on environmental sustainability is dropping the ball. Whether this is actually true or just a perception among Millennials. There are four ways that one can make his small business more sustainable:

8.1 **Review your baseline energy usage.** Contact your utility company to get detailed records of what your energy usage is. Some utilities will also conduct an energy audit for you, assessing wasteful practices and suggesting ways to improve energy savings.

8.2 **Look for government programs to help.** There are many tax credits, rebates and other incentives for businesses that can make becoming energy-efficient more affordable.

8.3 **Take advantage of nature.** Use low-tech solutions to save energy. For example, if the sun blazes into your office windows at sunrise every morning, try closing the window blinds at night so the office will be cool when employees arrive. Have ample natural light? Turn off your lights during part of the day and rely on windows or skylights.

8.4 **Involve your employees.** As the survey shows, today's employees—especially younger ones—are passionate about sustainability. Pick their brains for ideas and suggestions about ways you can make your business more sustainable. Also encourage them to practice sustainable business with simple acts such as turning off lights when they leave the room, powering down their equipment at the end of the day, and using reusable coffee mugs.

The units under GAP Sector are engaged in the production of items which are used in RMG industry as well as many other sectors of the economy. The RMG and other sectors, which use products and market their commodities to the world market through the global supply chain operators & must comply with their Code of Conducts otherwise, they will lose their market. And loss of market by RMG Sector means loss of market of GAP Sector. So, we must be cautious about the codes of conducts in respect of environmental standards. A number of suggested measures are listed below:

i) Awareness Building

ii) Green Building for Factory

iii) Installation of Effluent Treatment Plant (ETP)

iv) Industrial Estate for GAP Sector

v) Rethink> Reduce> Recycle> Reuse=F4R Principles

vi) To encourage companies to invest in activities that will assist in Bangladesh's efforts to introduce efficient waste management systems

vii) Companies which establish factories whose principal activity is waste processing including re-cycling will pay no corporate tax say for the first 5 years of their operations irrespective of location should be introduced.

viii) Establishing economy ETP plants under the ttz Bremerhaven, Germany technological assistance.

ix) The government has taken some steps to improve the pollution control of Bangladesh. But the steps are not adequate. As such, few more steps as under may also be taken to improve the environmental degradation:

ix.1. Use of Environmental Technologies and Methods.

Environmental technologies and methods such as Geographic Information Systems (GIS), remote sensing and environmental impact assessment might be used for integrated policy formulation, decision-making, evaluation and monitoring of environment.

ix.2. Development of Environmental Database.

A comprehensive environmental database may be made and the environmental planners might have the access for environmental up-gradation, planning and management The database is to be updated regularly.

ix.3. Environmental Education and Awareness.

Formal and informal methods of education might be adopted through local media, seminars, celebrations, workshops and student competitions to aware the people regarding the process of environmental degradation.

ix.4. Industrial and Solid Waste Management.

The government might take appropriate measures to monitor emission limits and Market Based Incentives (MBI) for reducing pollution control. The industries might be given both technical and financial support for introducing mitigation measures, promoting green technologies, using less pollution technologies and recycling the waste.

ix.5. Enforcement of Rules and Regulation.

Environmental Conservation Rules of 1997 and other relevant environmental laws might be enforced further to punish the violation of the emission limits.

x) Sustainable design brings it all together

Imagine being able to use less packaging, that is 50% recycled content and is 100% recyclable after many repeated uses? Those types of goals are being met every day and that is good for the bottom line and for the environment.

xi) The best eco friendly packaging solutions are those that are appealing to the company or consumer using them and also make economic sense. Yes, in some cases a compromise is made and perhaps it is not as green as some would like or the motives are not as pure as others would protest. However, positive change is positive change even if it is not perfect.

xii) Green Packaging: Waste Not, Want Not

By moving beyond conventional packaging methods and materials, companies can reduce their carbon footprints as well as their transportation cost and warehousing cost. Whether call it eco-friendly, sustainable, biodegradable, or natural, companies are looking for ways to "go green" with their packaging. While helping the environment is one benefit of eco-friendly packaging, packing products using fewer and more sustainable materials reaps additional rewards:

1. **Saving money.** Reducing excess packaging results in lighter and smaller shipments that cost less to transport. And greater quantities can fit on pallets, in shipping containers, in warehouses, and on retail shelves.
2. **Maintaining business.** Switching to green materials can help meet or anticipate customer demands for eco-friendly suppliers.
3. **Attracting consumers.** Many shoppers will choose an environmentally friendly product over a conventional package.

xiii) DOE must be technically strengthened for rendering meaningful technical advisory and supervisory services to the industries.

CONCLUSION

However, the biggest change agent, or at least the most influential, has been the buyers and from the buyers, the message is loud and clear: "we want more environmentally compliant sourcing". So, this is a critical time for the industry. With the tri-partite pressure points of the buyers, the government and the media, the time is rife for some change and many entrepreneurs are starting to see that in order to make their business sustainable, these are the measures that need to come sooner rather than later. The first step to greater compliance from the perspective of a factory is possessing a functioning and economic effluent treatment plant (ETP). But unfortunately most of the industries in the country do not possess effluent treatment plants. Latest figures state that the 1,700 washing-dyeing finishing units alone discharge 98,000 cubic meters of waste water into surrounding water bodies and land. This is because a large percentage of those factories do not possess ETPs or do not properly use them.

Recently, the concept of cleaner production has rapidly emerged across other significant markets in the region and with excellent results. As it stands, if proper "cleaner production" methods are implemented across the industry then it leads to cost savings which can not only cover the cost of compliance but at the same time also create a better working environment and increase profitability. Going green in packaging offers multiple benefits reducing the costs associated with creating packaging, decreasing weight and volume to reduce transportation costs, making it easier for customers to unpack products and creating less packaging-related waste.

The implementation of the Environment Policy is handicapped by some institutional limitations and thus appears to be less effective in responding to the demand side of the service and interventions. If such institutional issues are not rightly addressed, the Policy and the Act therefore, as one observer noted that it served the "rhetoric purposes only for the politicians and bureaucratic leadership". The National Environmental Policy does not clarify the measures needed for integrated efforts for environmental protection. It also fails to address the need for policy guideline concerning issues like, bio-safety, intellectual property right, watershed management and trans-boundary movement of hazards and environmental problems. However, with some modifications the National Environment Policy of Bangladesh can still be considered as a good foundation to bring about necessary changes to address and mitigate the major challenges of environment and for further improvement.

An Increased Focus on Minimizing Consumption

Many of the products I now see being promoted can easily and accurately be categorized in the three basics R's of sustainability.

Reduce – the new focus is on thinner, stronger materials able to do the same job with less material. This is consistent not only in paper products but especially in plastics after another turbulent year of resin prices, negatively impacting all forms of transparent, flexible packaging, and non-film products like plastic strapping, and carton sealing tapes. We are most definitely using less, not necessarily for the sake of the planet but for the sake of the bottom line.

Reuse – I see a lot more products that permit or encourage their reuse. Paper products such as boxes with specialty coatings designed to extend life and the increased popularity of returnable, reusable packaging such as totes, mailers, and other containers designed for multiple reuse. Companies love the economics of packaging that is not designed to be used and tossed, and they are taking full advantage of closed loop or internal return/reuse capabilities.

Recycle – if there is a long term positive impact to what appears to be for many companies a short term interest in sustainability, it is in this most important area. More products than ever before are being made with a large percentage of recycled content and even more are able to be easily recycled and are labeled as such. I would also say that most of the manufacturers I know use recycled materials because it saves them money and allows them to minimize the impact of multiple price increases on new or virgin materials.

While eco-friendly packaging is a recent phenomenon, it is already a large and rapidly growing trend. Source reduction in packaging has been going on for decades as a way to reduce costs. Until recently, however, few companies were doing it to increase sustainability. Packaging specialists are also investigating new ways to recover materials. Packaging should be designed to optimize materials and energy consumption, while maximizing the use of renewable or recycled materials.

Bangladesh Petroleum Corporation (BPC) is making 35% profit! per litre of petrol, while the entire economy is suffering due to this illogical state protection of a highly inefficient government corporation, Is it the spoon feeding open market economy we are practicing! Our industry sector including the RMG and Packaging & Accessories sector have become non-competitive in the export market. BPC-a state monopoly has been profitable of course by an artificial manner except for few years now since 1971. Good that they have entered into an era of net profit though at the high cost/ net loss of the nation. With the unprecedented increase in Government salary and perks in one go the inflation is already up further. We can observe indications of high dissatisfaction among a section of government employees and among the general public.

Garment accessories and packaging industry is an emerging SME Sub-Sector which has grown in response to the increasing demands of the RMG Sector. Therefore the units are located in the nearby location of the garment factory. The problems and challenges of social and environmental compliance are almost similar to those of RMG Sector. RMG Sector is already facing serious criticism worldwide for various non-compliance of social and environmental standards. Time has come for the member units of GAP Sector to be vigilant about compliance issues; otherwise this sector will face even worse consequences. The BGAPMEA with its limited resources has already started campaigning for compliance issue. The INSPIRED Project, funded by EU, is one of the most important steps to achieve the goal of social and environmental compliances by the GAP sector. Govt. and other donor agencies should continue their support to strengthen this process through compliance monitoring capacity building and related measures.

END PAPER