

# SUSTAINABLE MANUFACTURING – NEED TO SHIFT IN PARADIGM OF THE INDIAN MANUFACTURING SECTOR IN MICRO, SMALL & MEDIUM ENTERPRISES (MSMES)

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## Abstract

*“What we are producing today should be manufactured by the sustainable manufacturing process. It should not impact our future generation.” Rapid industrialization & economic growth of 7.5%, continues to improve living standard but it may not continue for the future generative modern manufacturing system, typically in Indian MSME consumes a large number of resources, generates waste, and pollutes the environment. Some Raw material and energy are consumed to make the product and the maximum amount of resources are wasted.*

*There is a paradigm shift required in the manufacturing sector from the traditional manufacturing model, in which environmental activities in a business were seen only on cost; natural resources are viewed as freely available. For manufacturers, sustainability has been emerging as a new competitive requirement to achieve differentiation in the market. The current proposed work is based on the development of a sustainable manufacturing model for Indian manufacturing MSMEs and proposed a framework for improving the performance to make them more sustainable. However, developing and maintaining a focus on sustainable manufacturing is a new and difficult challenge for Indian MSMEs. Industries are predominantly of Micro, small and medium enterprises, having little experience in environmental issues as most business is family-owned businesses and being run by single owners.*

**Keywords:** Manufacturing Model, MSMEs, Sustainable Manufacturing, Business strategies

## 1. Introduction

After World War II, the manufacturers were struggling to survive with very limited resources. This has led many organizations to implement the Toyota Production System (TPS), otherwise known as lean manufacturing. Competing and winning today in manufacturing requires a vision that includes Environmental Sustainability (Green) with enterprise-wide practical strategies that deliver clear, measurable, and rapid returns. Today’s winning companies are combining Lean and Green strategies and tactics to spot and eliminate many wastes that are often overlooked. The current definition of Green has contained the notion of “helping to sustain the environment for future generations.” Returns like positive cash flow, reduced energy, material, and operating costs can make or break a company today. The emerging working definition of Lean as “The elimination of waste everywhere while adding value for customers” is bringing Lean and Green together at last. The reason being is that Green does this elegantly by following the wisdom of the natural world which is both truly efficient and effective in creating value and that produces no waste at all.

Centuries ago, when natural resources were abundant and labor was scarce, industries strived to find ways to increase labor efficiency by introducing diverse manufacturing strategies and technologies. Strategies ranged from job flexibility, shift-work, time-and-motion study, and mass production to lean production, while technologies ranged from machine tools, engines, and automated devices to robots and automated lines; all these were designed and used to increase labor productivity to meet customer demand. Modern manufacturing consumes large amounts of resources, generates waste, and pollutes the natural environment. So, a question has been asked as to whether continued industrial expansion and manufacturing production in the current manner would be sustainable in the long term.

## 2. Literature Review:

Efforts made by researchers from as early as the 1960s promoted ‘pollution prevention’ (Dales 1968) and the IPAT equation [the multiplicative contribution of population {P}, affluence {A} and technology {T} to environmental impact {I}] (Ehrlich and Holdren 1971, Commoner 1972, Holdren and Ehrlich 1974 as cited by Fischer-Kowalski and Amman 2001). In 1987, the Brundtland report popularised the concept of sustainable development which is defined as ‘meets the needs of the present without compromising the ability for future generations to meet their own needs.

However, it was not until the ‘wake-up call’ in 1992 at the Earth Summit in Rio de Janeiro, when nations met to discuss problems due to pollution that they agreed on the need for actions toward sustainable development. While no agreement between nations was reached at the summit on the issue of pollution, the consensus on there being limits to what we could put into nature (in the form of pollution) as well as what we could take out of nature (in the form of raw materials) did result in industries and organizations starting to work towards practicing sustainable material/resource strategies such as resource efficiency, eco-efficiency, and sustainable development. The connection between lean and green manufacturing has been well documented in recent literature (Angel, Kalsen, 1999; Sawhney, Teeparakuland Li 2007) green or sustainable manufacturing is defined by Allwood (2009) as a method to “develop technologies to transform material without emission of greenhouse gases, use of nonrenewable energy or without generation of toxic waste. Notably, green wastes are very different from lean waste. Lean seeks to eliminate traditional waste like cost, time, and production (Bergman, Hermann Stehr, & Sebastian 2007) while green is concerned with impacting the environment (Bergmiller & Mcwright, 2009)

For industry, a widely-used and basic strategy to increase the efficiency with which we use available resources is to concentrate efforts on the recovery of products or materials at the end of their useful life [which includes re-use, re-manufacturing, recycling, and energy recovery and is termed the waste hierarchy (Jackson 1996)]. Schmidt- Bleek (1995) pointed out that less than 20% of all materials originally moved (disturbed and extracted) end up in products and infrastructure. This makes the overall recycling capacity very limited. Lovins (2003) suggests that from the 100% of natural capital extracted to make a product in the United States, commonly only 7% of materials become products that we end users to see or use, meaning 93% becomes waste within industrial processes (this includes extractive and manufacturing waste). Out of the 7%, 1% becomes durable and 6% becomes waste from customers’ first use. Going further, of these 1% consumer durables, only 0.02% is recycled or remanufactured and the balance of 0.98% becomes persistent waste from disposal (typically landfill).

The Brundtland Commission defined sustainable development in 1987 as “*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*” (World Commission on Environment and Development 1987). Sustainable manufacturing refers to developing and practicing technologies to transform materials into finished products with a reduction in each; energy consumption, emission of greenhouse gases, generation of waste, and use of non-renewable or toxic materials (Madu 2001). While practicing environmentally friendly manufacturing, the business must remain economically viable and socially beneficial. Hence, the Triple Bottom Line (TBL), i.e., people, planet, and profit assess a Company’s performance.

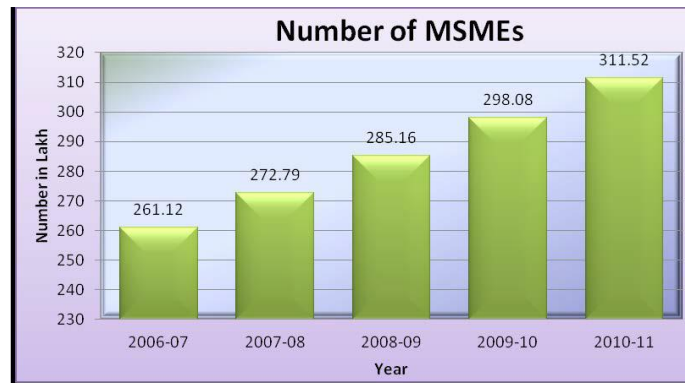
Sawhney, Teeparakul, Aruna, and Li (2007) show the connection between lean manufacturing and the environmental movement stating that “*it is natural that the lean concept, its inherent value-stream view and its focus on the systematic elimination of waste, fits with the overall strategy of protecting the environment*”, which they call Environmental Lean (En-Lean). Typical metrics for measuring environmental performance include scrap or non-product output, materials use, hazardous materials use, energy use, water use, air emissions, hazardous waste, and water pollution (EPA 2005). None of these is directly optimized in a typical lean implementation, so it is difficult to know whether a lean process is operating at optimal environmental performance. To help address this question, Simons and Mason (2002) developed *sustainable value stream mapping* by adding a sustainability metric (supply chain carbon dioxide divided by the market weight of the product) to the conventional value stream mapping process. Similarly, Karp (2005) advocates adding environmental aspects to value stream maps.

Moreover, it is unclear how an optimal future state map would be developed for Micro, Small & Medium enterprises. However, developing and maintaining a focus on sustainable manufacturing is a new and difficult challenge for Indian MSMEs. Industries are predominantly of Micro, Small and Medium enterprises, having little experience in environmental issues as most business is family owned businesses

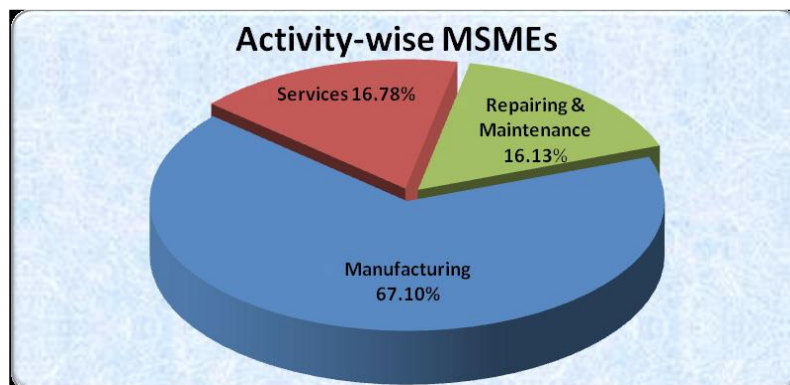
and is run by single owners. In addition, to eliminate waste, there is a need for a fundamental shift in the business model. The business that first makes the changes will have competitive advantages. Those that don't make efforts won't be a problem because ultimately they won't be around.

**MSME's Status in India:**

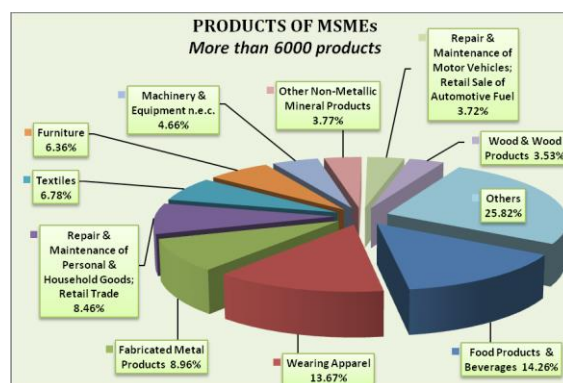
It is estimated that 311 lakhs of MSMEs are working in India (shown in fig 1) and in terms of value, the MSME sector accounts for 45% of manufacturing output and 40% of the total export of the country. MSMEs contribute around 8.2% of GDP. In all the MSMEs approximately 732 lakhs people are employed.



Out of total registered MSMEs, approximately 94.9% are Micro industries, 4.8% are small and 0.2% are medium enterprises. 67% of industries are manufacturing industries as shown in fig 2



90% of the MSMEs is propriety firms and are run by a single owner. The focus of the proposed research will be the manufacturing sector as it contributes maximum. There are over 6000 products ranging from traditional to high-tech items, which are being manufactured by MSMEs as shown in Fig no. 3



Source: - Final Report of the Fourth All India Census of Micro, Small & Medium Enterprises: Registered Sector.

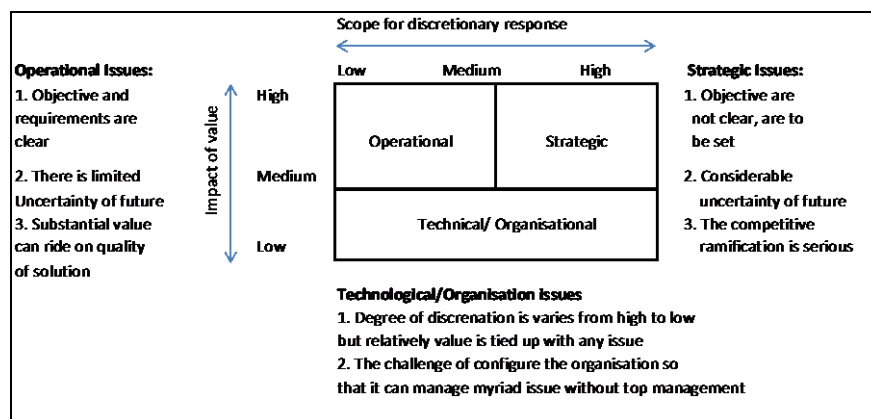
**Approaches for building environment in business thinking of MSMEs:**

The below five approaches that managers/ entrepreneurs can take to identify those circumstances and integrate the environment into business thinking. The five approaches are as follows: -

1. Differentiate the product: - The idea behind environmental product differentiation is straightforward: MSMEs create products or employ a process that offers great environmental benefits.
2. Managing your competitors: - Not all companies will be able to increase their profits through environmental product differentiation. But some may be able to derive environmental and business benefits by changing the rules of the game so that playing fields change in their favour.
3. Saving cost: - Third approach is focusing not only on environmental issues but also reduce internal costs. Some organizations can cut costs and improve environmental performance simultaneously.
4. Managing Environmental risk: - For many organizations Environmental management means risk management. Most of the costs like close out, accidents, and lawsuits are being taken care of directly by environmental management.
5. Redefining Markets: - Some companies can follow several approaches and in the process redefine the markets through remanufacturing.

### The path of pragmatism for MSMEs

MSMEs must focus on a “trade-off zone” where environmental benefits are weighed judiciously against value destruction. Only focusing on value rather than compliance, emission, or quarterly cost can provide entrepreneurs with information to set priorities and develop business responses. Entrepreneurs must set clear priorities based on the potential impact on shareholder values. Within this framework, environmental issues can be broken into three broad categories: Strategic, Operational, and Technical as shown in below fig 4.



### Beyond Greening – Strategies for Sustainable Manufacturing in MSMEs: -

30 years ago environmentalist Paul Ehrlich made a power full observation about sustainable development. i.e.

$$\text{Environmental Burden (EB)} = \text{Population (P)} \times \text{Affluence (A)} \times \text{Technology (T)}$$

Achieving sustainability will require stabilizing or reducing the environmental burden. That can be done by lowering the population, lowering consumption, or changing the technology to create wealth. Controlling the population is beyond feasibility at this stage and controlling the consumption will even worsen the situation. That leaves only the third option i.e. changing technology to create wealth for them and society both. MSMEs need to have a clear vision at this stage to guide them through three stages of environmental strategy:

### Stage one: Pollution prevention

This stage is governed by the principle “Prevention is better than cure”. Pollution control means cleaning up waste after it has been generated. Pollution prevention focuses on minimizing or eliminating the waste before it is created. MSMEs need to build the prevention in manufacturing model at the stage of inception.

### Stage two – Product Stewardship

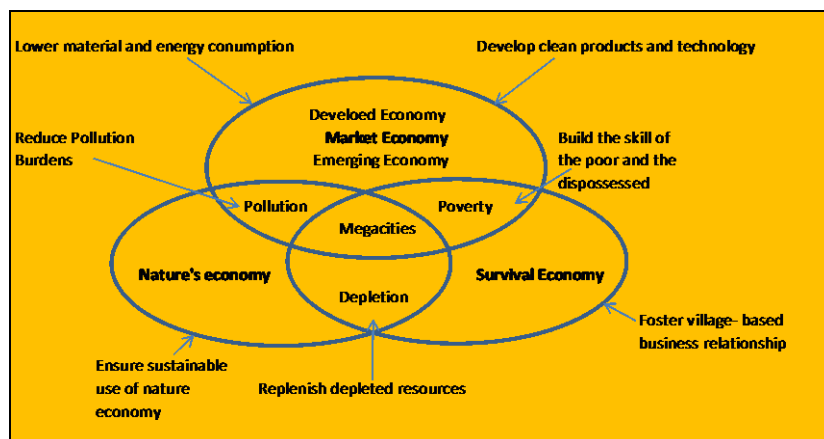
Product stewardship focuses on minimizing not only the pollution from manufacturing but also all environmental impacts associated with the full of life cycle of products. The organization’s need to look for Design for Environment (DFE), a tool for creating products that are easier to recover, reuse, or recycle is becoming increasingly important. Cradle to crave analysis begins and ends outside the boundaries of the company’s operation. By reducing material and energy consumption, DFE can be highly profitable

### Stage three – Clean technology

MSMEs with their eyes on the future can begin to plan for and invest in tomorrow’s technologies. The simple fact is that the existing technology base in many industries is not environmentally sustainable. Cleaner technologies are desperately needed in Micro Small and Medium Enterprises. The sustainability portfolio analysis for MSMEs is shown in fig 5

	Internal	External
Tomorrow	<p><b>Clean technology</b></p> <p>1. Is the environmental performance of our products limited by our existing competency base? 2. Is there potential to realize major improvement through new technology?</p>	<p><b>Sustainability vision</b></p> <p>1. Does our corporate vision direct us towards the solution of social and environmental problems? 2. Does our vision guide the development of new technologies markets, products and processes</p>
Today	<p><b>Pollution Prevention</b></p> <p>1. Where are the most significant waste and emission streams from our current operation? 2. Can we lower costs and risks by eliminating waste at source or by using it as a useful input?</p>	<p><b>Product stewardship</b></p> <p>1. What are the implication for products design and development if we assume responsibility for a product's entire lifecycle. 2. Can we add value or lower costs while simultaneously reducing the impact of our products</p>

A clear and fully integrated environmental strategy should not only guide competency development, but should also shape the company’s relationship with customers, suppliers, other companies, policymakers, and all stakeholders. Companies can and must change the way customers think by creating preferences for products and services consistent with sustainability. The rapid growth in emerging economies cannot sustain in face of mounting environmental deterioration, poverty, and resource depletion. See Building sustainable business strategies in fig 6.



## **The benefit of Sustainable Manufacturing for MSMEs:-**

### **Process benefits:-**

- Material saving resulting from more substitution, reuse, or recycling of production inputs.
- Better utilization of by-products, and conversion of waste into valuable forms.
- Lower energy consumption during the production process.
- Reduce material storage and handling cost.
- Elimination of cost of activities involved in discharge or waste handling, transportation, and disposal.

### **Product benefits:-**

- Higher quality, more consistent products, and lower product cost (Material substitution).
- Lower packaging cost, more efficient use of resources by-products.
- Lower net cost of product disposal to customers.
- Higher product resale and scrap value.

### **Conclusion:-**

The new world of sustainable technologies and business strategies is undoubtedly a challenging and exciting emerging reality for the manufacturing industries. Key drivers of compliance, community expectations, risks, costs, and market competition will ensure that those who don't adapt will be left behind. The role that manufacturing will play in creating and shaping this world is significant and will require steadfast commitment and effective strategies that embrace the full extent of sustainable possibilities. A sustainable organization will take a broad perspective of sustainability that includes environmental, social, and economic criteria and engages the entire stakeholder community. Critical elements will be in skills development, new, sustainable technologies, and lean and efficient manufacturing practices. In this paper, we have identified problems managers experience when trying to make their organizations more sustainable. Some of these problems are due to managers addressing sustainability as an operational rather than as a strategic issue.

Hence, sustainability is the "ingredient" that has been missing from these organizations' strategies. We have argued that for organizations to become more sustainable, managers must address the different dimensions of sustainability at the strategic level, both during the strategic decision-making process and as part of the strategy content at the corporate, business, and functional levels. Managers and scholars can use the framework we have provided to assess the degree to which organizations have strategically addressed sustainability and to identify opportunities for further improvement. Although we have analyzed each element of the framework separately, it is important to recognize that all elements are interconnected and significantly influence each other. Developing an organization that regards sustainability as a cornerstone for doing business requires a strategic approach that integrates economic, environmental, and social considerations in all aspects of the business.

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