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Sustainable Industrial Development

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Abstract--Industrialization has been fundamental to economic development. Not only is industrialization the normal route to development, but as a result of the globalization of industry, the pace of development can be explosive.(11) Many countries have reached higher development levels in all dimensions – economic, social and environmental – for the benefit of their people. Yet, steady prosperity has not been achieved throughout the world and there remain remarkable differences between and within regions, countries and societies. Growth in the past occurred too often without providing the opportunity of participation and reward to significant segments of the population, and women and youth in particular. Clearly, future strategies for poverty reduction need to be economically empowered. As a response to these challenges, is promoting inclusive and sustainable industrial development (5) .The industry views Sustainable Development as a challenge put before all parts of society. In the advances made in its own operations, its improved performance and in the improvements to the human condition made through its products, the industry sees cause for optimism and believes that Sustainable Development can be the intellectual framework around which industry and also sectors of society can reach consensus on how to improve living standards and the environment.(1)

Keywords— Sustainable Industrialization, Industrial ecology, Environment pollution, Circular economy, Green Industry

I. INTRODUCTION

This the key finding of "Our Common Future", (the 1987 report of the United Nations' World Commission on Environment and Development), is that environmental, economic and social concerns must be integrated if the world's peoples are to advance and develop without jeopardizing the natural environment on which all life depends. Although today we cannot define the needs of future generations, the challenge for today's leaders is to pursue policies that will leave available an array of choices for future generations to meet their own needs.(1)

Simply defined, Green Industry is industrial production and development that does not come at the expense of the health of natural systems or lead to adverse human health outcomes. Green Industry is aimed at mainstreaming environmental, climate and social considerations into the operations of enterprises. It provides a platform for addressing global, interrelated challenges through a set of immediately actionable cross-cutting approaches and strategies that take advantage of emerging industry and market forces. Green Industry is therefore an important pathway to achieving sustainable industrial development. It involves a two-pronged strategy to create an industrial system that does not require the ever-growing use of natural resources and pollution for growth and expansion. As seen in Figure 2, these two components are (1) the greening of existing industry, and (2) the creation of new "Green industries".(10) However, experience shows that environmentally sound interventions in manufacturing industries can be highly effective and significantly reduce environmental degradation .We have the technological capabilities for cleaner industrial production today. "Green industry" can be promoted to deliver environmental goods and services. These industries by themselves are a sustainable source for further structural diversification, jobs, income and prosperity. Moreover, committing to sustainable production patterns makes business sense as it reduces wastage of costly resources, and contributes to increased competitiveness.(5) The need for environmentally sustainable modes of production and a more efficient use of resources i.e. Green Industry, is becoming increasingly evident. This is especially so in the developing world, which has the unique opportunity of avoiding the environmental pitfalls that the developed world has fallen into in the course of its industrial development; it can use past experience to build a Green Industrial infrastructure at the very outset.(10)

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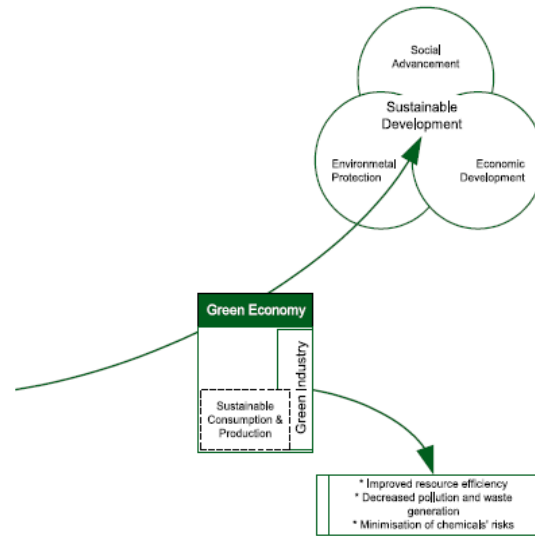


FIGURE 1: THE SUSTAINABLE DEVELOPMENT PATHWAY

We define sustainable industrial development in terms of three parameters: 1) growth of endogenous productive capacities, especially the capacity for innovation; 2) improvement in the environmental performance of industry; and 3) improvements in living standards and a reduction of inequality, especially via growth in the quantity and remuneration of jobs in the manufacturing sector.(7) It can be used to mean economic sustainability, social sustainability, institutional sustainability as well as environmental sustainability. The environmental sustainability agenda in industry, which is the topic of this paper, covers the protection of the resource base, the reduction of negative externalities and the promotion of positive externalities.(8)

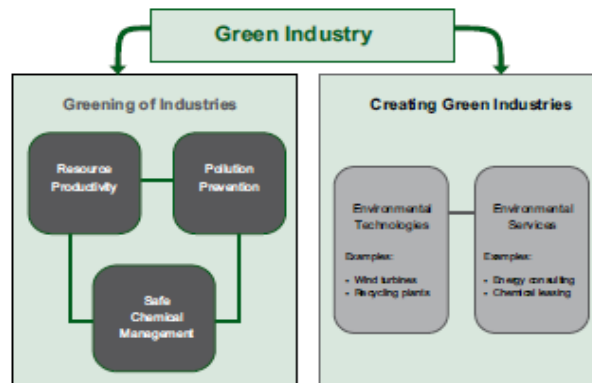


FIGURE 2: GREEN INDUSTRY - A TWO-PRONGED STRATEGY

Sustainability in economic terms means the efficient management of scarce resources as well as a prospering industry and economy. Sustainability in the environmental sense means not placing an intolerable load on the ecosphere and maintaining the natural basis for life. Seen from society's viewpoint, sustainability means that human beings are the centre of concern. In view, particularly, of the population increase worldwide, there needs to be provided as large a measure of equal opportunities, freedom, social justice and security as possible.(1) The first element of Green Industry is fundamentally about the greening of all industry, with a long-term focus on continuously improving environmental performance regardless of sector, size or location. It includes commitment to and action on reducing the environmental impact of processes and products by:

Improving production efficiency: using resources more efficiently and optimizing the productive use of natural resources;

Enhancing environmental performance: minimizing environmental impact by reducing the generation of waste, emissions and

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environmentally sound management of residual wastes; and

Minimizing health risks: caused by environmental emissions, along with the provision of goods and services that support the occurrence of these environmental emissions (10)

Sustainable Development will only come about if three goals - economic, environmental and society-related - can be reconciled. To determine the limits of acceptability and scope for action requires a set of conventions which society at large accepts as valid.

The main objective sustainable industry is to stimulate the start-up and growth of industries as well as enhance indigenous participation by altering the ownership structure and management of industries, it was characterized by a high degree of technological dependence on foreign knowhow to the extent that the domestic factor endowments of the country were grossly neglected, therefore seemed to have neglected many of the factors required for managing the emergent industrial sector and in particular, the management of technologies transferred or acquired.(6)

The main challenges facing the world include:

Optimizing the benefits obtained from depleting resources

Assuring against excessive strains placed on the eco-system

The dynamic growth of the world population

Remedying social and economic inequalities

These are challenges on a global scale. It follows, therefore, that the attainment of Sustainable Development will call for action on the part of the people, governments, businesses and organisations around the world. The global chemical industry has realized this challenge.

II. LITRATURE REVIEW

Sustainable Development will only come about if three goals - economic, environmental and society-related - can be reconciled. To determine the limits of acceptability and scope for action requires a set of conventions which society at large accepts as valid.

Greg skeleton *et al.* (1996) has explained that the global chemical industry, as represented by the International Council of Chemical Associations (ICCA), recognises that it should put forward an international position on Sustainable Development - supported by local, national or regional activities.

S. Erkman(1997) presented that through an essentially analytical and .descriptive approach (basically an application of materials-balance principle), aimed at understanding the circulation of the materials and energy flows linked to human activity, from their initial extraction to their inevitable reintegration, sooner or later, into the overall biogeochemical cycles. Industrial ecology goes further

Prof. Dr. Jingfu Gu *et. Al.* (2011) described that that Traditional linear industry is a short-sighted unsustainable development mode of the economy

Stamm, A. *et al.* (2009) describes about increasingly obvious that the developed world's systems of production and consumption have contributed to rapid resource depletion, the degradation of ecosystems, and the threat of climate change (United Nations Millennium Ecosystem Assessment).

L. N. Chete *et. al.* (2011) describes The structure of the Nigerian economy is typical of an underdeveloped country. The primary sector, in particular, the oil and gas sector, dominates the gross domestic product accounting for over 95 per cent of export earnings and about 85 per cent of government revenue between 2011 and 2012.

III. SUSTAINABLE INDUSTRY: IMPLIMENTATION AND DECOUPLING

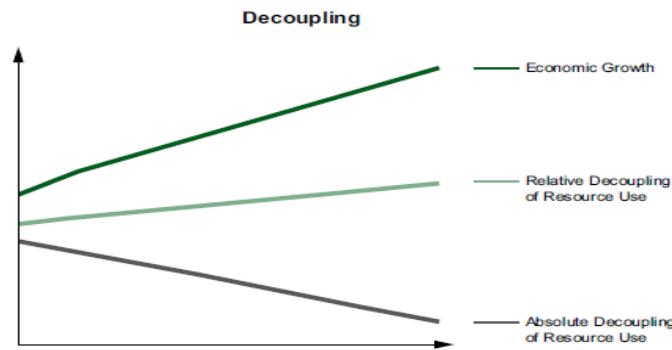
Progress towards SD rests on the simultaneous and balanced achievement of economic development, social advancement and environmental protection. While the concept of SD has been ensconced in policy circles for decades now, operationalizing this concept has proven to be a challenging task. The recent emergence of concepts such as Green Economy, Green Industry and Green Growth are reflective of the need for strategies or roadmaps to help achieve SD and shift current consumption and production patterns on to paths that are more sustainable in the long run, while keeping resource constraints and carrying capacity limits in mind. There is a great need as well as considerable potential for the pursuit of Green Industry in developing and transition countries. To ensure that the industrial progress of developing countries does not result in skyrocketing emissions and ecosystem degradation,

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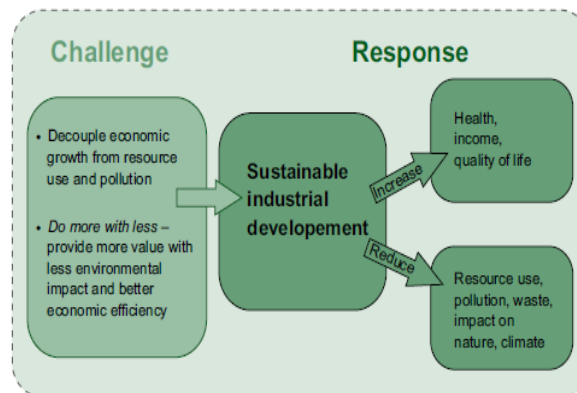
it will be vital to pursue a different mode of development than the traditional high-energy, high-emission modes of industrialization. This means maximizing energy and water efficiency, substantial recycling, and applying improved consumption and production systems.(10) Up to roughly the income level of advanced economies, one can grasp such a transition by looking at shifts from one sector to another (mainly from agriculture to industry and services), but at higher incomes, average employment-to-output ratios converge and further evidence of structural change can only be seen within sectors.(16) However, despite the growing recognition of the risks and tradeoffs inherent in industrial expansion, unrestrained industrial growth remains the goal in many countries, and resource use, pollution, and degradation of the environment are only increasing in absolute terms.(11).

A. Decoupling Resource Consumption

Industrial energy consumption, still growing in developed countries, is soaring in developing countries. Developed countries remain the largest per capita users of both total energy and industrial energy, but developing countries are quickly catching up– satisfying domestic demands for improved living standards and import demands from developed countries– and becoming large energy consumers.(14)



There are two types of decoupling: relative, in which production rises but increases in resource use and pollution do not rise as quickly; and absolute, in which production is able to increase while resource use and pollution fall (ibid.). It is also important to distinguish between resource and impact decoupling, since it is possible to decouple pollution from production but not from resource use; or to decouple resource use from production, but not from pollution. The decoupling discussed here will be in terms of both resource use and impacts.(10)



Governments have a very important role to play in creating the market conditions to allow the renewable energy industry to grow. It also has an important role to ensure that renewable materials – primarily biomass – are produced sustainably. The use of management systems is the most effective means for any enterprise to ensure that it efficiently and continuously implements 3R strategies. Certification of that system by third-parties increases its value to the enterprise-Reduce, Recycle, Reuse. This requires them to first maximize the efficiency with which they use their energy and raw materials, using cleaner production, pollution

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prevention, green productivity or similar approaches.(12)

IV. BENEFIT OF SUSTAINABLE INDUSTRY

The development of Green Industry presents benefits on three fronts — economic, social and environmental. This section will describe what exactly a policy locale can expect to get when it elects to employ Green Industry as an approach to economic and industrial development.

A. *The Economic Goal of Sustainable Development*

The inter-relation of economic systems is complex, with a variety of relationships among countries. Multi-national chemical companies apply common standards in spreading investment capital and stimulating markets around the globe, thus setting the scene for the world market. What they need, in order to play a constructive role in Sustainable Development, is, first and foremost, freedom and fairness in international trade. Trade as an engine of economic growth is essential for Sustainable Development This includes bringing to a halt the growing intervention by governments in industry and their ever increasing demands to raise income by taxation, thus imposing a disproportionate load on the business community. Wealth creation and profits are fundamental to Sustainable Development. They sustain economies, and contribute, via re-investment and R&D, to new technologies and environmental improvements. Profits are needed to create flexible company structures oriented towards economic, environmental and society-related requirements.

B. *The Environmental Goal of Sustainable Development:*

The chosen integrated approach to environmental protection and waste minimization must be developed in a consistent manner. The aim must be to integrate environmental protection considerations into products and processes as early as possible in the development phase. Integrated environmental protection also enhances plant and product safety and allows waste disposal to be improved and made more efficient. This parameter clearly meets the Product Stewardship Code of the chemical industry's "Responsible Care" initiative.

C. *The Society-Related Goal of Sustainable Development*

Waste-management and recycling in the informal sector are an important source of income for many in developing countries, but income and working conditions are often poor. Green Industry would aim to not only bring this sector into the formal economic sphere, but to modernize its techniques and processes. New or enhanced systems for recycling and reuse of materials would ensure that valuable resources are not wasted, but would also offer opportunities for poverty reduction through the creation of new, formal income-generating industries and jobs with improved working conditions.(11)

V. BARRIER

While there is a compelling case that Green Industry generates sustainable industrial development benefits in each domain — economic, environmental and social — its widespread adoption is not necessarily a straightforward proposition. This section will outline the barriers that exist to the meaningful uptake and development of Green Industry in developing countries.

A. *Lack of Resources*

There is no argument over the fact that new infrastructure will need to be put in place for the full transition to a Green Economy to occur. This will, more often than not, involve significant up-front costs. In many cases, developing countries will lack the resources required to support the development of Green Industry in their countries be it a lack of technology, knowledge and expertise, or simply a matter of insufficient capital. Without financing and the transfer of knowledge, skills and technologies to the developing world, the global transition to a Green Economy will take place at a very slow pace. The need to address environmental problems grows every day, and therefore, a serious push is needed on the part of developed countries to facilitate and aid developing countries in making their transition to a Green Economy, if serious damage to ecosystems and climate is to be avoided.

B. *Institutional Inertia*

Industries in countries may themselves be resistant to change. Although Green Industry is in the long-term best interests of the industrial sector as a whole, there will inevitably be winners and losers. Lobbying efforts on the part of industries that perceive

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themselves to be threatened will be intense, and this is why it is important that industry is brought on board as a partner in Green Industry initiatives. Not only is the engagement of industry important because of the valuable insight and leadership industry can provide, but it is also essential that it is not made an opponent because of its ability to slow or block the efficacy of important Green Industry initiatives. The same goes for unions, which may perceive jobs to be threatened by the new policy landscape.

C. Market And Policy Failures

Market failures can distort market prices and send the wrong cost information to economic actors, serving as a barrier to the development of Green Industry. Market failures can come in the form of externalities, they can be due to market power, or they can be the result of misguided government intervention. If markets and policies are not properly calibrated, they can hamper attempts to encourage and support Green Industry initiatives.

VI. CONCLUSION

There are significant opportunities for utilizing the Green Industry approach to assist developing and transition countries in dealing with pressing social concerns while, at the same time, ensuring that these countries enjoy Green Growth. Developing countries with emerging and expanding industrial infrastructure have a particular opportunity to increase their competitiveness by applying resource efficient best practices from the outset in new industrial facilities, rather than following the slower path of first investing in traditional infrastructures and then upgrading. It is frequently argued that by utilizing available modern technology and by commercializing new knowledge, developing and transition countries could leapfrog several stages of development and rapidly attain a higher degree of industrialization.

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