

## SIMULTANEOUS REALIZATION OF ENVIRONMENTAL SUSTAINABILITY AND ECONOMIC GROWTH

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### ABSTRACT

The problem of managing industrial and solid waste is addressed; the solution proposed seeks to realize both economic and sustainable growth simultaneously. This implies achieving economic growth while preserving the ecosystem in a way that does not adversely affect the quality of life and the resources available for future generations.

The contribution sought is two fold: first, economics principles are extended to include not only exchangeable goods and services, but the ecosystem's entities as well. Secondly, these extensions are used to achieve both economic and sustainable growth, accounting for the impact of individuals and firms' behavior on current and future generations. A strategic framework denoted as "SAM" is proposed to guide this realization. It comprises three main processes starting by specifying points of strength and weaknesses in the internal environment, and the opportunities and threats in the external environment, analyzing these carefully, and then manage accordingly in a way that realizes appropriate fit between society's needs, and the available resources and capabilities. The core idea is to pursue continuous development and growth till no more improvement can be made for some stakeholders without adversely affecting others, including future generations.

**Key Words:** Sustainable Growth, Industrial and Solid Waste Management, Eco-efficiency.

### INTRODUCTION

This paper addresses the problem of how to manage industrial and solid waste in a way that preserves the ecosystem while increasing the welfare of all affected parties.

The contribution sought is twofold:

First: concepts from welfare economics are extended to include not only market forces of supply and demand, but all the ecosystem's entities as well. Secondly: how to make use of these extensions to achieve sustainable growth is illustrated, accounting for the impact on current and future generations. A conceptual framework and implementation guidelines are proposed to help achieve sustainable growth in practice.

The plan of study consists of five parts. Part I comprises the problem of interest and scope of the study. The need for replacing the pure "Economics" view with an "Eco-centric" view is discussed in Part II along with its implications on sustainable growth. Part III discusses why and how sustainable growth can be realized. Waste management policies that help achieve this sustainable growth and implementation guidelines are presented in Part IV. We conclude in Part V by a summary of the research findings and suggested issues for future research. This study has been motivated by the observed implications of current management

practices, emphasizing pure economic growth and the pursuit of self interest regardless of the impact on: society as a whole, the external environment and ecosystem, and the resources left for future generations.

Current management practice at the firm level is based on, and is directed by, three main assumptions: First, the fundamental principle of Economics that, resources are allocated and managed by the market forces of supply and demand. Except in the case of market failure. Secondly, there exists a dual consciousness toward natural ecology; i.e., maximizing one's firm self interest while neglecting the impact of such egoist focus on society as a whole in general, and on the resources left to future generations in particular. Risks associated with industrial and solid waste have negative impacts on human safety and health, and the environmental (SHE). Such impacts are often borne by the ecosystem and by uninvolved third parties, including future generations (Kleindorfer, 2001). Thus, market forces are not usually sufficient to motivate profit-seeking companies to operate efficiently. Thirdly, there is a focus on tangible monetary outcomes and quantitative measures while overlooking significant intangible consequences and non-quantitative factors.

The above assumptions that direct practice contradict the realization of sustainable growth, i.e., achieving development that meets present needs without

compromising the ability of future generations to meet their own needs, as well. Thus, the above assumptions are insufficient and misleading. How business practice and human behavior driven by the above assumptions have resulted in drastic negative implications is now discussed.

Looking at the economy in mechanistic terms, where forces of supply and demand explain how resources are allocated, assumes adherence to communities' interests through the marketplace transactions, and that the pursuit of self interest balanced by a competitive system would result in society being better off in material wealth than by any other alternative system. Thus, people and organizations are encouraged to pursue their self-interest without any external controls on their behavior that might promote the welfare of the community. This means that people were "let off the hook," as the system itself would take care of any ethical or other concerns related to broader responsibilities to society.

As a result of this pure economic thinking, what cannot be traded in the market where the value can be determined by the forces of supply and demand, have no value, and is not worth considering. For example, the environment has no value in and of itself, as the environment deteriorates; this is not factored into marketplace transactions nor is part of our national accounting system.

While sustainable growth encompasses much more than pure economics, we become a money-centered culture; "if you cannot cash it, trash it." As a result, economic incentives have to be built in; otherwise, producers and consumers will not deal with environmental problems without being forced by laws and regulations. Yet, placing all moral freight on the regulatory process is asking this process to do more than it can deliver. Why this is the case is now discussed in more detail.

### ECOCENTRICITY

The regulatory process involving environmental laws and regulations and enforcement agencies, such as EPA in the U.S., and the EEA in Europe, is not sufficient nor is efficient to cure the current business practices and its human behavior and its environmental implications. This is due to the facts that:

- Costs of compliance may be excessive and is placed eventually on the consumers, taxpayers, and on society as a whole.
- The proactive orientation toward the natural environment, where "prevention is better than cure," will not be faithfully practiced, if at all, as long as the

pure market economics view remains the norm of practice;

- Since nature has no discrete owner to look after its interests, its rights will continue to be violated; and as common property, it can be and will continue to be overused, abused, and is subject to the tragedy of the commons;
- Furthermore, it should be noted that both the "Social Responsibility" view and the "Stakeholders" view are mainly human centric; i.e., they overlook the environment with its nature entities.

Therefore, an "Eco-centric" view should replace the "Anthropocentric" one. This implies that the emphasis should be on sustainable development and growth and not on economic growth. A focus on "Sustainable" practices of business, and human behavior, and "sustainable" productivity should replace the current emphasis on "economic" productivity.

Why and how this sustainable growth can be realized is now discussed.

### REALIZATION OF SUSTAINABLE GROWTH

As indicated earlier, sustainable growth means achieving a development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

It should be noted that achieving sustainable productivity is much beyond classical economic analysis. It implies that both business firms and human behavior focus on ecological sustainability; i.e., the ability of one or more entities to exist and flourish – individually and collectively – such that the existence and/or growth of other collectivities of entities is permitted at related levels, times, and related systems (Buchholz and Rogene, 1993; Koeing, et. al., 2000).

Sustainable productivity implies sustainable development. It is the process of achieving human development in an: inclusive, connected, equitable, prudent, and secure manner, (Saad, 1994, 1999).

-Inclusive, means not harming any other entity time wise and place wise.

-Connected, means embracing economic, ecological, and social interdependence.

-Equitable, means inter-generational, intra-generational, and inter-species fairness.

-Prudent, i.e., connotes duties of care and prevention: technologically, scientifically, and politically.

-Secure, i.e., assures safety from chronic threats and protection from harmful disruption.

A legitimate question here is why do we need sustainable growth or sustainable productivity? This is because business practice and human behavior, which are in harmony with, and strive to achieve sustainability, will result in:

- a) Improving the quality of life effectively and equitably; i.e., without adversely affecting the opportunities, or harming the resources, available for future generations (Ko, 1998).
- b) Emphasizing qualitative improvements, not only quantitative expansion or measures.

Several studies have addressed the impact of environmental management on business performance and quality, e.g., (Klassen, et. al., 1996; Saad, 1999, 2001 (a), 2001 (b), 1994, 1991).

- c) Making use of the important fact that, productivity cannot grow indefinitely, yet business and technology will.
- d) Companies be able to minimize costs and stay competitive though adhering to an ecological approach to manufacturing, and handling of industrial waste, where ecological costs and benefits are taken into account. A leading example here Dupont practices, e.g., banning phreon and replacing it by environmentally friendly products (for more details, the reader is referred to, Talvo, et. al., 1997).
- e) Societies will have a chance to raise their living standards only if they seek sustainability in their public policies, business performance, and productivity measures, and into the consumption patterns they adopt, as well as their solid waste generating and processing practices.
- f) Recognizing people, businesses, and their technologies as part of the natural world makes it possible to imitate, and learn from, the best workings of biological ecosystems and build artificial ones that are sustainable as well.

How to reap the above benefits of sustainable productivity and what are the management policies that would generate these outcomes in practice? Is now discussed.

### **MANAGEMENT POLICIES AND IMPLEMENTATION GUIDELINES**

To assure sustainable growth and guarantee generating the positive outcome outlined above, necessary changes have to take place:

First: From an Operations prospective ; companies can and should focus on environmental improvements. These comprise:

- Promoting new manufacturing technologies, e.g., use clean burning technologies, and cogeneration of their own energy along side conservation efforts. Good examples in this regard are followed by PG&E, H.B. Fuller, using solar energy and canceling plans to build large coal and nuclear power plants.
- Encourage technological advances that reduce pollution from both products and manufacturing processes. Example of this practice the 3M program that eliminated pollution at the source, and the Chevron's SMART program (Save Money And Reduce Toxic). This reduced hazardous waste by 60% and saved the company over \$3.8 million.
- Develop new product Compositions, which result in source reduction of waste, pollution, and environmental hazards.
- Eliminate manufacturing wastes as possible, and find alternative uses for wastes generated that cannot be eliminated. For example, IBM's Endicott-New York facility has cut toxic emissions by 75% in 1990 compared to the previous year, by replacing water-based chemicals for the solvent-based chemicals used in high volume circuit panel manufacturing. Amoco and Polaroid have adopted similar programs, and the Dow's WRAP program (Waste Reduction Always Pays). This later program reduced the waste stream by 88 million pounds per year (Conservation Exchange, 1989).
- Expand the RRR (Reduce, Recycle, and Reuse) policy in the U.S. following the lead of many European countries, and Canada.
- Design for Disassembly. This is a very effective operations practice especially for metal and plastic products. This concept involves using fewer components, simpler designs, and new ways for fastening of things together.

Second: From a Quality of Life standpoint:

- The present systems of industrialization, productivity measurements, and solid waste generation and treatment have to change radically to provide the people's needs for both higher living standards and reduction of environmental impacts, simultaneously.
- Additionally, the traditional view of industrial activity as mere transformation of raw materials into

products that enhance people's standard of living has to be replaced by a more integrated view. This means moving from an "industrial system" view to an "industrial ecosystem" view, where: consumption of energy and raw materials is optimized; waste generated is minimized; influence of one process on other processes is accounted for; give more incentives for: recycling, conservation, and resource recovery. Pertinent optimization methods to use, to achieve these results are discussed in (Gottinger, 1991) among others.

Third: Productivity measures used at the micro level of the firm should account for, and consider the macro impacts of the industrial processes used and the products produced. Such macro implications include each environmental entity, as well as the environment as a whole. For instance, consideration should be given to the currently overlooked impacts of industrial activity on: the natural environment and ecological systems; the resource base left to future generations; both local and global entities, and on societies external to the underlying firms.

Fourth: From a Financial Prospective; guidance to firms' and individuals' investment should focus on:

- Gaining the respect of socially responsible investment of business firms in general, and for socially responsible services in particular. Those investment funds that promote and help people invest with a "clean conscience", (Irwin, 1985). The theme here is that people should be able to "do well" while they are "doing good".
- Recognize the True Liability. For example, Smith Barney, and other investment firms search for true environmental liabilities in evaluating a company's performance. Also, the "people's right to know" act and the ISO14000 standards allow for, and induce environmentally responsible practices.
- Recognize business opportunities associated with solid waste businesses (e.g. Waste Management, Laidlaw industries and Browning-Ferris). Empirical evidence show that stocks of those businesses have outperformed the overall stock market performance consistently (Buchholz, et.al., 1992, p. 167).

Fifth: at the macro level; public policies at both national and international levels have to promote, assure, and provide incentives for micro practices (at the firm and individual levels) that are "eco-centric"; i.e., environmentally friendly and promoting sustainability. Example of these include:

- Generalization of the 'bubble' concept; by sale or trade of credits to other firms, which resulted in pollution reduction while expanding industrial and economic growth, simultaneously. This concept was adopted by EPA in the early 1980's (for more details on this policy the reader is referred to Buchholz, 1993, pp.161-163).
- Providing tax incentives for green products and sustainable agriculture.
- Banning the use of chemical fertilizers and hazardous materials for pest control
- The problem of sustainability involves more than physical production and consumption.(Gowdy, 1997, pp. 180-181). It is intimately connected with power relationships and the distribution of economic surplus, Thus, the trade agreements for example, should explicitly account for the impact of trade on income inequality, and be written in a way that deal with potential adverse effects on environmental quality.

As indicated by Arrow, et.al. (1995), the incompatibility between economic growth and environmental sustainability is an issue of increasing concern. Current trade agreements, as GATT and NAFTA, fail to recognize this incompatibility based on the belief that continual growth is the only solution to the problems of income inequality and environmental degradation. Therefore, progressive pressures should be put on governments to directly address these questions in trade agreements, rather than assuming that market forces will eventually correct them.

Thus, the issue of trade can be a mechanism for addressing the larger questions about the long range viability of our socioeconomic system. The lessons learned from constructing environmentally sound trade treaties could be a model for moving the global economy toward environmental sustainability.

Such *proactive* actions should prevail and replace the current *reactive* schemes of regulations and compliance enforcement.

Sixth: Coordination should take place between both micro policies at the firm and individual levels, and the macro policies at the national level (Saad, 1999). Such coordination is necessary to maximize the welfare for firms and nations on the one hand, and for the present and future generations, on the other hand, *simultaneously*.

It should be noted that a focus on sustainable growth in goals, means, and actions will assure realizing maximum efficiency; i.e., a "Pareto frontier" where:

every party (or entity) is better off without any other being worse off, internally or externally, in the present time or in the future. This point is now addressed in more detail.

### **Reaching Pareto's Maximum Efficiency Frontier**

Pareto's concepts and efficiency frontier are of particular interest here. How these concepts can be extended and made use of, in managing industrial and solid waste, is now discussed. Two main Pareto principles are of relevance:

**First: The 80/20 Rule:** The idea here is that only a few significant factors control the majority of outcomes and results achieved. Hence, management can focus only on those few significant factors and neglect the insignificant many that contribute little to the end results, as illustrated in Figure 1.

**Second: The Pareto frontier;** i.e., maximum efficiency, is reached when nobody can be better off anymore without harming any other party. The authors view is that by extending this economics principle to include all elements of the ecosystem, not only humans or people, would help assure sustainable growth, (Saad, 2001 (b)).

When changes and/or improvements can continue to be made such that stakeholders are better off and no other entities of the ecosystem are worse off, only then maximum sustainability is reached, by not harming the resources available to both current and future generations simultaneously, as this assures accounting for all stakeholders' interests and concerns including the ecosystem entities and elements. An important consideration for good environmental policy is its dynamic effects, such as innovation. By affecting the nature of innovation, today's environmental policy not only affects today's environmental quality, but also influence the potential of future environmental quality, (Popp, 2003).

It should be noted however that in a non-zero sum economy some stakeholders plan on driving up the cost of their competitors. This implies a built in struggle working against reaching a Pareto frontier. Both government and public interventions are needed to provide incentives for environmentally sound innovations, and deterrents to the non-cooperating parts of the market. Example of these would be imposing penalties-fines- on unfair practices, and destructive competition. Anti-trust laws are one example of such actions. An important empirical lesson here is the influence of the CAA, which provided incentives for R&D innovations of scrubbers of higher removal efficiency, and the amount of output produced per unit

of emission increased as well. Additionally, the development of cleaner technologies make it easier for policy proposition of tighter limits on future emissions, as it lowers the potential costs of compliance with such regulations.

As to how to make use of these propositions in managing industrial and solid waste in practice, we suggest the following conceptual framework and action guidelines.

### **A Conceptual Framework**

The framework proposed consists of three main processes denoted as **SAM**, which stands for Specify, Analyze, and then Manage, as follows:

The starting process involves searching and specifying (S) the underlying community's characteristics, needs, and priorities. This can be done through a WOTS analysis; i.e., study the internal environment's weaknesses and points of strength; and the external environment's opportunities and threats. The aim here is to work on exploiting the opportunities and points of strength and avoiding and/or minimizing the weaknesses and threats. We suggest using a cause and effect 'fishbone' model at this stage to delineate, and understand the WOTS analysis results. This should be followed by a detailed analysis (A) of the underlying driving factors and tradeoffs. Such analysis should make use of the Pareto 80/20 rule, i.e. identify, and focus on, the most significant few factors; all the remaining, i.e., the many insignificant factors may be neglected or given less attention and concern. At this stage, effort should be made to adopt appropriate quality management policies to be able to exploit this analysis benefits to its fullest. For more details on these policies the reader is referred to (Saad and Siha, 2000). This analysis is then followed by a Management process (M) that would match and fit the results of Phase 1 and 2 above using Pareto Efficient Frontier for all stakeholders and ecosystem entities. As indicated earlier, this frontier is reached when "no one can be better off anymore without making other(s) worse off."

This can be realized through management practice and individuals' behavior seeking to match the market and communities' needs to the available resources and operational capabilities. This match and cooperation among all levels, will result in the appropriate *fit* between the society's needs on the one hand and its capabilities on the other hand.

### Action Guidelines

To help realize the above framework in practice, some guiding actions are suggested on the part of both business managers and government agencies. Both should seek, and strive for continuous and equal participation of all stakeholders in the process.

Furthermore, business managers must conduct continuous benchmarking “peer-wise” among the different regions, and ‘activity-wise’ among the different activities involved. The aim here is not just to learn from the ‘star’ but also seeking to eventually lead and exceed the ‘star’, i.e., reversing the gap between the current firm performance and the pertinent leader.

It should also be noted that each party –business managers, legislators, and law enforcement agencies – should strive for continuous advancement productivity-wise and quality-wise. This should be the norm of both business and individual behavior. On the government’s part for instance, tax incentives; regulations and educational programs can be used jointly, to foster this behavior. A tax –incentive approach for segregation of waste, provides a good example of close cooperation between both private and public institutions in India (sivramkrishna (2003). As reported by this author, the costs of enforcing waste generators to segregate organic waste, or to prevent illegal dumping, make this policy useless to implement. Instead, market incentives which induce households to segregate organic waste have been practiced intensively and successfully, in underdeveloped countries.

Additionally, practitioners at all levels and in all sectors should adopt and establish the Environmental Management System (EMS) under the ISO14000 international standards, and the related systems such as those promulgated by the European Union under the Ecological Management Audit System (EMAS), (Kleindorfer, 2001). Such systems when reinforced by public scrutiny, result in tangible benefits to both the industries, and the public, making all stakeholders better off. This is quite noticeable across Europe.

As indicated earlier, environmental concerns should be explicitly addressed and dealt with in international and bilateral trade treaties.

Furthermore, management should encourage not only continuous or gradual improvements, but also ‘leap frog’ advancements that can be achieved through business process and technical reengineering efforts and programs.

Positive outcomes are also assured by establishing appropriate national incentives for each stakeholder

category. These include both positive reinforcement of preventive measures and desired behaviors and; negative reinforcement, i.e., ‘penalty’ for undesired actions, and/or behaviors, by business firms, households, or the public.

We agree with those who consider the distinction between public policy and private policy as a cultural artifact. Removing certain issues from public debate results in conflict privatization, and in a mismatch between the relative importance of many private decisions and the degree of public involvement in them. While ordinary people are not completely powerless, their ability to affect corporate decisions is quite limited (Van Horn, et.al., 2001, pp.81-83).

It should be also noted that public policy concerns are different for different stakeholders, and are also shaped by the nature of the times. While disagreement exists about the appropriate role government should play, there is a fundamental agreement on the nation’s principal public policy aspirations. These include among other things, achieving sustained economic growth, ensure equal opportunity, and to protect the environment. These are central policy goals of all governments.

American public policy has achieved great progress to preserve and protect the air, water, and land for survival. Yet, these policies are not as effective as they should be. For instance, meeting the unprecedented threats to the environment resulting from global warming, preservation of nature treasures, and reduction of disruption risks faced in business operations, those of purposeful agents, and unintended acts.

To be able to overcome these challenges, extraordinary skills, coupled with further coordination and close cooperation between public and private policies, are needed.

### **SUMMARY AND CONCLUSIONS**

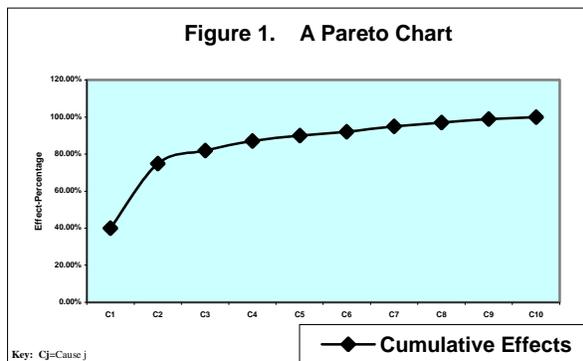
This paper addressed the problem of managing industrial and solid waste in a way that assures preservation of the ecosystem, and welfare improvement for stakeholders involved.

Two main economics principles have been extended and applied to realize sustainable growth, namely, the 80/20 rule, and the Pareto efficiency frontier. The efficiency frontier concept has been extended to include not only human concerns for the present, but also all entities of the ecosystem, and accounting for the impact on current and future generations.

To summarize, the negative implications of the pure economics “anthropocentric” view were discussed, and the need for replacing this view by an “eco-centric” one was justified, as a sustainable growth emphasis in the eco-centric view replaces the mere economic growth emphasis in the anthropocentric one. Thus, the eco-centric is a much better theme to follow. How to realize the “Eco-Centric Vision” and reap sustainable growth benefits has been discussed, and specific management policies and actions are proposed. An integrated SAM framework is introduced to assure reaching the efficiency frontier. This framework comprises three stages: specify, analyze, and then manage. How to apply this framework in practice has been discussed, along with guidelines that would facilitate its implementation.

Such implementation actions recommended includes the alignment of micro and macro policies on the one hand, and between both individuals’ and firms’ behaviors, on the other hand. These, in addition to accounting for, and incorporation of environmental protection considerations and Eco-efficiency concerns, in trade treaties. This include both international and bilateral trade agreements as well.

A necessary next step that would assure actual realization of this paper thesis is that each decision maker and policy developer acts accordingly at all levels, each in his/her own capacity. These include: managers and officials in business firms, individuals and households, government representatives and agencies, as well as the general public.



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