

Innovative Responses by Industry to Reduce Environmental Pollution and Degradation

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Abstract

The growing environmental concerns, coupled with public pressure and stricter regulations, are changing the way of business across the world. Industry is on a three-stage journey from environmental compliance, through environmental risk management, to long-term sustainable strategies. Faced with the increasing burden of regulation, businesses choose to go beyond compliance towards comprehensive environmental programmes and sustainable development. To improve their control of environmental performance, companies conduct environmental health and safety (EHS) assessments, develop environmental policies and implement environmental management systems (EMS). Techniques such as pollution prevention and the 4Rs are used to translate policy objectives into practice. Operating costs are reduced through waste minimization, pollution prevention and the elimination of health and safety hazards. Whereas environmental protection is often regulated, sustainable development involves going beyond compliance. Most pollution is caused by human activities. There have been several innovative responses towards reduction of pollution in business and industry. These include pollution control; pollution prevention; waste minimization; use of energy alternatives and adoption of green economy; use of clean process technology and best management practices (BMPs); industrial ecology and polluter pays principle. Others include, greening public procurement, e-commerce and transactions. To counter negative environmental impacts, the final decade of the twentieth century saw a positive shift in emphasis from “end-of-pipe” controls on releases to the environment to the elimination of potential pollution at its source (“beginning of pipe”). Rather than try to “fix” a problem after it occurs, industries have begun to “eliminate” the problem before it occurred.

Keywords: *Clean Technologies, Sustainable Development, Environmental Pollution and Degradation*

Introduction

Environmental pollution and degradation are among key global environmental issues (Pickering & Owen, 1994). Growing environmental concerns, coupled with public pressure and stricter regulations, are changing the way people do business across the world. The world of industry is on a three-stage journey from environmental compliance, through environmental risk management, to long-term sustainable strategies (IISD, 2010; Kong, Steger & Ionescu-Somers, 2002). In the initial phase of the journey, the need to comply with environmental regulations drives improvements in environmental performance. Businesses adopt a more proactive approach in the next phase. Environmental risk management is introduced to reduce environmental liabilities and to minimize the costs of regulatory compliance. A substantial number of companies recognize that the implementation of sustainable business strategies can lead to new opportunities and improved results, business and sustainable development phase.

Faced with the increasing burden of regulation, some businesses choose to go beyond compliance towards comprehensive environmental programmes and sustainable development (Kong *et al.*, 2002). To improve their control of environmental performance, some companies conduct environmental health and safety (EHS) assessments, develop environmental policies, and implement environmental management systems (EMS). Techniques such as pollution prevention or recycling are used to translate policy objectives into practice. Business and industry operating costs can be reduced through waste minimization, pollution prevention and the elimination of health and safety hazards.

Sustainable development and environmental protection are similar in several aspects. By protecting the environment, industries and businesses support sustainable development (Muthoka, Rego & Rimbui, 1998). On the other hand, whereas environmental protection is often regulated, sustainable development involves going beyond compliance. Although some environmental pollution is a result of natural causes, most pollution is caused by human activities (Goudie, 1986). However, there have been several responses towards reduction of pollution in business and industry. These responses have included pollution control, pollution prevention, waste minimization, use of green and clean energy, adoption of green economy, use of clean process technology and concepts such as best management practices,

industrial ecology, and polluter pays principle among others (IISD, 2010; Santos, Covello & McCallum, 2007).

To counter negative environmental impacts, the final decade of the twentieth century saw a positive shift in emphasis from “end-of-pipe” controls on releases into the environment to the elimination of potential pollution at its source (“beginning of pipe”). Rather than “fix” a problem that has already occurred, industries began to seek ways to “eliminate” the problem before it occurred.

This paper highlights some of the emerging innovative responses by industry and business towards reduction of environmental pollution and degradation, with the hope that such innovations can be adopted by others for the benefit of the environment

Responses towards Reduction of Pollution in Business and Industry

Paper Saving Innovative Responses to Reduce Environmental Pollution and Degradation

The slogan “Go Paperless – Go Green” is now common. Less paper also means few trees are cut and a green environment is sustained. Sellen and Harper (2002) note that the world is headed towards offices that use not only less paper, but rather towards offices that keep less paper.

Innovative technologies include saving paper with PrintEco that enables reduced number of pages printed. PrintEco software employs small algorithms that optimize the content being printed to fit on a smaller number of pages.

In office settings, simple steps such as making double-sided copies and printing drafts on the backsides of discarded paper will substantially reduce the consumption and the disposal of paper products.

In a report, Ragent (2008) argues that the use of paper more responsibly and reduction of the amount of paper used effectively drive business improvement from cost, communication and environmental standpoint.

Emerging technologies have made possible a paperless office and/or less paper transactions a reality. These include desktop publishing, the web, e-mail, XML, content management systems, e-newspapers, among others.

However, paper continues to predominate activities that involve knowledge work, reading and collaborations; although paper is becoming a more temporary medium as many people print, use and discard documents rather than keeping everything they print. Responsible use of paper starts with using less and recycling, including printing on both sides and use of lower fonts. Paper has to be produced in ways that are sustainable. The paper-saving innovations have helped to reduce and manage the impact of paper consumption on the environment. Extensive use of recycled paper is now common practice. Innovations in paper manufacture enable paper to be produced by mechanically grinding wood into pulp instead of using chemicals. This environmentally friendly process produces twice as much paper from the same amount of trees. Other sustainable innovations or “green products” that deliver enormous benefits to the environment include solid ink printing technology, which generates 90 per cent less waste than comparable laser printers; more energy efficient printers, copiers and multifunction devices.

Innovative Information and Communication Technology (ICT) Applications by Industry to Reduce Environmental Pollution and Degradation

The outstanding one is the trend setting ICT application in the financial sector of Kenya, mobile money transfer service that was pioneered locally in 2007 by Safaricom Company Limited (GoK 2006; Vaughan, 2007). M-Pesa is an award-winning money transfer technology application based on mobile phones (Hughes & Lonie, 2007; Jenkins, 2008; Omwansa, 2007; Safaricom, 2008).

Safaricom is not authorized to operate as a bank; the money being circulated is deposited in a physical bank account at the Commercial Bank of Africa, which supervises the daily transactions of M-Pesa. Users make their transactions using virtual information (NEMA, 2008; The Option, 2007). M-Pesa transactions and online payment of bills have gone a long way in addressing environmental pollution.

An M-Pesa transaction is less demanding on the environment compared to other methods of money transfer. A typical M-Pesa transaction booklet has 150 pages, with each page accommodating 90 transactions in 3 columns of 30 rows each, therefore cutting down drastically on the use of paper. Omwansa (2009) elaborated on more innovative uses of M-Pesa and the issue of mobile money ecosystem. Currently only Safaricom subscribers can register to use M-Pesa. But it provides even more benefits if more players can plug into this network and provide additional services. Additional innovative ICT applications include use of e-mails for communication, e-commerce, e-ticketing, e-banking (SIM-pled banking), e-evidence in litigation, e-books, among others.

More recent innovations include on-line registration of students, e-learning and e-registration of candidates for national examinations by the Kenya National Examinations Council.

Cutting Wastes

In Germany, anti-packaging laws have reduced packaging by 17% since 1991 and increased the recycling rate from 12% -86% (Erica, 1995; IISD, 2010; Santos, 2007). France, Belgium and Austria have adopted similar legislation. Twelve countries are placing similar take-back measures for electronic goods. The Netherlands has set a national goal for waste reducing of 70-90% return rate, implying that bottles could be re-used as many as 100 times. In the case of Denmark, landfill taxes have boosted the re-use of construction debris from 12% to 82% in only 8 years, far ahead of the 4% rate of most industrialized countries (Miller, 1996).

Environmental Business Costs

Environmental advancements have been made over the past 150 years regarding industrial behaviour (Goudie, 1986). In the past, companies were able to regard the air, land, and water as free goods. Often, companies saw the pollution they generated as something they could externalize. That is, since air, land and water pollution usually affects areas that businesses do not own, then it was not their responsibility to address and consequently there was no need to increase costs in order to limit their wastes. Industrial polluters then passed on the environmental costs of their operations, instead of incorporating them into their own cost structure. Today, the attitude is completely different. The originator is responsible, on both a legal and moral basis, to the spread of pollutants into the air, land, and water, and must shoulder the cost of any required cleanup. Environmental costs are a legitimate and justifiable part of doing business, but as with any cost, it is desirable to minimize these costs as much as possible. Environmental costs may be brought into a company as an internal cost. This occurs as a result of compliance with regulations or anticipation of future regulations; sustainable development initiatives; voluntary cleanup programs and initiatives to attain international certification.

Polluter Pays Principle

This is an environmental policy which requires that cost of pollution be borne by those who caused it. Responsible industries have generally adopted this principle. It aims at determining how the costs of pollution prevention and control must be allocated. Its immediate goal is to internalize the environmental externalities of economic activities so that the prices of goods and services fully reflect the cost of production. Miller (1996) identifies four versions of the Polluter Pays Principle. Economically, it promotes efficiency; legally, it promotes justice, promotes harmonization of internal environmental policies and defines how to allocate costs within a state. The normative scope of the Polluter Pays Principle has evolved over time to include also accidental pollution prevention, control and clean up costs referred to as extended polluter pays principle. Today this principle is generally a recognized by international environmental law.

Responses towards Zero Emissions

There have been several responses beyond the strategies of pollution control. This calls for the need to explore other approaches which could lead to pollution prevention and elimination during production processes. The main aims of such approaches are pollution prevention, elimination and minimization. These responses, strategies and approaches include: (a) Cleaner production, (b) application of green technologies, (c) industrial ecology, (d) eco-factory approach, and (e) waste minimization (Miller, 1996).

Cleaner Production

This approach is known as pro-active, as opposed to passive, approach. This is the continuous application of an integrated preventive environmental strategy in industrial processes, using a life cycle approach and results in meeting customer needs with more environmentally compatible products and services.

The idea is that industrial processes can often be improved in ways that not only reduce the amount of wastes and, therefore, pollution but also save or make money or good business. Cleaner production involves services that incorporate environmental concerns into designing, producing and delivering of goods and services. It aims at production processes which conserve raw materials and energy through efficient use, eliminate use of toxic raw materials and reduce the quantity and toxicity of all emissions and wastes. Cleaner production is a strategy going beyond technologies to encompass broader issues such as management and government policy and extending both upstream and downstream of the production process. Cleaner production is a forward-looking process with anticipation and prevention philosophy and employs process that use less toxic or non-toxic raw materials; systems that increase process efficiencies and reduce raw materials use and losses; systems that collect wastes and pollutants, and recycle them back into the production process.

Application of Green Technologies

It is the application of appropriate technologies and management techniques to produce environmentally sound or compatible goods and services for enhanced productivity and profitability. End of pipe pollution control approach may be sufficient to meet regulatory requirement but is not effective or sustainable in the long term. It leads to secondary pollution. It enhances productivity while improving environmental performances. It involves the application of appropriate technologies techniques and management systems to produce quality and environmentally compatible goods and services and is applicable to all sectors.

Industrial Ecology

Both the zero emission initiative and the eco-factory fit firmly into the concept of industrial ecology. A low or none waste concept is central to this concept. In-stream recovery and the re-use of materials are crucial. Environmental considerations are incorporated into all aspects of products and process design.

Industrial ecology focuses on the interaction between different industrial and ecological systems. One goal of industrial ecology is to change the linear nature of industrial systems where raw materials are used and products, by-products and wastes are produced to a cyclical system where wastes are re-used as energy or raw materials for another product or process.

The aim is to create an integrated system that optimizes the use of by-products and minimizes the waste streams that leave the system.

Eco-Factory Approach

The eco-factory concept has been described as the ultimate 21st century technology. The eco-factory essentially consists of production-system and restoration-system technologies. Products shipped out of the factory are used by consumers, and then discarded as wastes which are collected and fed to the restoration system for recycling as material resources for the production process. On the production, side the aim is first to design products that have minimum impacts on the environment, both during the production phase in terms of raw materials and energy use as well as pollution and at the post -consumer disposal stages of their lives. The wastes produced can be reused via the restoration process.

The eco-factory approach calls for five basic technologies, namely product design, production disassembly, materials recycling and control and assessment.

Waste Minimization

Waste minimization is the reduction of waste that is generated and subsequently treated, stored or disposed off. It includes volume reduction as well as the reduction in the quantity of toxic constituents of waste toxicity. Toxicity may be covered by quality of method used, including chemical and thermal destruction. Reduction in the quantity of wastes generated is usually achieved by measures applied at the source of waste generation, including manufacturing process modification, changes in raw materials or recycling or re-use of waste. Waste minimization is a waste management approach that focuses on reducing the amount and the toxicity of hazardous waste that is generated. The 3 general methods of waste minimization are source reduction, recycling and treatment.

Greening Public Procurement

Detailed orders for public procurement have been established to ensure best value for money. Best value in this instance should include best environmental value (NEMA, 2010). Green procurement means procuring goods, services or works while taking into account environmental factors. Green public procurement is much more than just purchasing of recycled paper for office use. It is about tapping into a huge market where the environmental impact related to the production, transportation, use and disposal of goods and related services can be reduced. Public authorities in Kenya have a huge purchasing power and by using their market leverage to opt for goods and services that also respect the environment they can have a major influence on suppliers and stimulate the production of more sustainable goods and services. By giving a clear signal to all parties involved in the procurement process public authorities can draw new environmental technologies into the market and strengthen the competitiveness of Kenyan industry. Green procurement will also help Kenya meet obligations for energy-efficiency in buildings, energy services and reduce carbon dioxide emissions and adoption of less polluting public transport.

Pollution Prevention and Sustainable Development

The end of pipe technologies just causes pollution to be shifted from one environmental medium to the other. The focus of end of pipe technologies is cleaning up pollution after it has been generated. Faced with limitations inherent in pollution management strategies industry is shifting towards a more preventive, pro-active approach referred to as pollution prevention, which is reduction or elimination of wastes and pollutants at their sources. Pollution prevention encompasses redesigning of products to cause less waste or pollution during manufacture, use or disposal, altering production process to minimize the

use of toxic chemicals, implementing better house-keeping practices to minimize leaks and fumes released from manufacturing processes, taking steps towards efficient energy consumption. In homes, minimizing the use of toxic household chemicals such as drainage cleaners and herbicides will reduce the amount of hazardous chemicals that eventually end up in the environment.

Most focus of pollution prevention has been on industries. This is because industry is the major contributor to environmental problems; therefore, it is industries that implement this technique. Other economic sectors such as agriculture and transportation also impose tremendous environmental burdens.

Producing Less Waste and Pollution is the Best Choice

The low-waste approach has the following hierarchy of goals: reduce waste and pollution; re-use as many things as possible; recycle and compost as much waste as possible; chemically or biologically treat or incinerate waste that cannot be reduced, reused, recycled or composted, and bury what is left in state-of-the-art landfills or above-ground vaults after the first four goals have been met.

An increasing number of industries are learning that reducing waste and pollution can be good for corporate profits, worker health and safety, the local community, consumers, and the environment as a whole. Such methods seek to: save energy and virgin resources; reduce the environmental impacts of extracting, processing and using resources; improve worker health and safety by reducing exposure to toxic and hazardous materials; decrease pollution control and waste management costs (which are now rising faster than the rate of industrial production) and future liability for toxic and hazardous materials and are usually less costly on a life-cycle basis than trying to clean up pollutants and manage wastes once they are produced.

Conclusion

Without pollution control, waste from development activities will degrade the environment regardless of whether they accumulate or disperse. In the hierarchy of controls, pollution prevention and waste minimization are more desirable than pollution control.

Due to the links between pollution and profit, environmental economics has become relevant. Some countries have adopted a pollution control mechanism that tends towards detailed regulation of technology leaving polluters with little choice on how to achieve the environmental goals. This "command-and-control" strategy increases the cost of pollution controls and may even slow our progress toward a cleaner environment (Crandall, 2008). The use of mandated technologies to minimize pollution has been in effect for a quite a long time. Environmental regulations often require firms that emit pollutants to limit emissions to a set level or to install specific emission-reducing technologies. While fairly straightforward, this command-and-control approach can be costly both to the firms and to society. Firms with high costs of pollution reduction and those with low costs are required to meet the same requirements, which may waste resources.

This strategy is preferred when the pollutant is especially harmful but also presents a challenge to the government as it has to keep up with the pace of technological change. Due to limitations of command-and-control approaches, more proactive concepts beyond pollution control have evolved over time to minimize pollution to acceptable levels. Preventing pollution by applying "Best Management Practices" (BMPs) is easier and more economical. General BMPs in pollution prevention applicable to most business and industries include pollution prevention plans, proper hazardous materials storage, materials management, spill response and prevention and trash management.

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