



Undergraduate Economic Review

Volume 3 | Issue 1

Article 1

2007

Economic Implications of Environmental Sustainability for Companies: A Case Study of 3M

Kristina Luus
Dalhousie University

Sarah Beckerman
Dalhousie University

Timothy Nash
Dalhousie University

Recommended Citation

Luus, Kristina; Beckerman, Sarah; and Nash, Timothy (2007) "Economic Implications of Environmental Sustainability for Companies: A Case Study of 3M," *Undergraduate Economic Review*: Vol. 3: Iss. 1, Article 1.
Available at: <http://digitalcommons.iwu.edu/uer/vol3/iss1/1>

This Article is brought to you for free and open access by The Ames Library, the Andrew W. Mellon Center for Curricular and Faculty Development, the Office of the Provost and the Office of the President. It has been accepted for inclusion in Digital Commons @ IWU by the faculty at Illinois Wesleyan University. For more information, please contact digitalcommons@iwu.edu.

©Copyright is owned by the author of this document.

Economic Implications of Environmental Sustainability for Companies: A Case Study of 3M

Abstract

As awareness of sustainability grows, firms are being pressured to adopt social and environmental practices to keep pace with ethical standards and consumer demand. Firms must adapt to a changing marketplace, and new management strategies are being developed. Our central purpose in this paper is therefore to explore the economic implications of enhanced environmental sustainability through a case study of 3M, a chemical company that has been implementing sustainable solutions for over 30 years. We begin our case study by analyzing the effectiveness of the lifecycle management approach (LCM) currently advocated to businesses in search of sustainability. Although the LCM methodology is still developing at this stage, it has yielded great results for 3M when combined with employee expertise. We will then go on to analyze why these increases in sustainability have increased profits, and what effect tighter environmental legislation would have on competitive markets. The final section of this paper will analyze the performance of environmentally responsible firms on the stock market to determine whether increased sustainability makes firms more desirable to investors. Our critical analysis of the multi-faceted economic implications of enhanced environmental sustainability will therefore allow us to determine 1) the effectiveness of current approaches to sustainability; 2) the economic implications of enhanced corporate responsibility and legislation, and 3) the impact of enhanced sustainability on the performance of companies on the stock market.

Undergraduate Economic Review

A publication of Illinois Wesleyan University

Vol. III – 2006 - 2007

Title “Economic Implications of Environmental Sustainability for Companies: A Case Study of 3M”

Author Kristina Luus, Sarah Beckerman and Timothy Nash

Affiliation Dalhousie University

Abstract As awareness of sustainability grows, firms are being pressured to adopt social and environmental practices to keep pace with ethical standards and consumer demand. Firms must adapt to a changing marketplace, and new management strategies are being developed. Our central purpose in this paper is therefore to explore the economic implications of enhanced environmental sustainability through a case study of 3M, a chemical company that has been implementing sustainable solutions for over 30 years. We begin our case study by analyzing the effectiveness of the life-cycle management approach (LCM) currently advocated to businesses in search of sustainability. Although the LCM methodology is still developing at this stage, it has yielded great results for 3M when combined with employee expertise. We will then go on to analyze why these increases in sustainability have increased profits, and what effect tighter environmental legislation would have on competitive markets. The final section of this paper will analyze the performance of environmentally responsible firms on the stock market to determine whether increased sustainability makes firms more desirable to investors. Our critical analysis of the multi-faceted economic implications of enhanced environmental sustainability will therefore allow us to determine 1) the effectiveness of current approaches to sustainability; 2) the economic implications of enhanced corporate responsibility and legislation, and 3) the impact of enhanced sustainability on the performance of companies on the stock market.

Table of Contents

Abstract

Table of Contents

1- Introduction

2. Effectiveness of the Life-Cycle Management Approach (LCM)

2.1- Theoretical roots of LCM

2.2- 3M's approach to LCM

2.3- LCM in Practice at 3M

3. Economic implications of 3M's Pollution Prevention Pays program (3P), and the market-wide implications of tighter environmental regulation

3.1- Deferred cost of pollution control equipment

3.2- Reduced material and operating expenses

3.3- Increased product sales

4- Sustainable Responsible Investing (SRI)

4.1 – Performance of firms that use SRIs

4.2- Critique of the selection criteria

4.3 – Performance of sustainable responsible funds (3M)

5- Conclusions :

References

1 - Introduction

Business profits and sustainability have long been thought to be mutually exclusive goals because of the increased risk involved in implementing changes to current techniques and strategies. Even after the environmental implications of business practices became clear in the 1960s and 1970s, businesses remained in denial about their environmental impact and have fought against tighter environmental standards (Hart, 2000: 106). However, with increased knowledge about environmental impacts, new innovations in processing technologies and the threat of tighter regulations and increasing energy costs, many businesses have begun taking steps along the path to sustainability. The purpose of this essay is to examine the economic implications of sustainability on businesses by examining 3M's practices and performance since they first began implementing sustainable practices thirty years ago. Our analysis will first focus on the success of current strategies for implementing sustainable practices, focusing especially on Life-Cycle Management approach implemented by 3M. After this analysis, we will examine why 3M has had increased profits from the implementation of sustainable practices, and if increased environmental legislation could lead to market-wide profitability. We will then analyze how sustainable stocks have performed and whether increased sustainability leads to better performance on the stock market.

2 – Effectiveness of the Life-Cycle Management Approach (LCM)

2.1- Theoretical roots of LCM

Increasingly in the past few years, corporations have been receiving pressure from their staff and consumers to “incorporate economic, environmental and social

performances in their policies, culture and decision-making processes” (Brent, 2005: 557). Although several manners to cope with these demands have arisen recently, one of the more popular is by adopting life-cycle management (LCM). A way of defining LCM is through its aims, which are to expand

“the scope of the environmental management system of a company to address the up- and downstream impacts associated with the activities of its suppliers and customers” (Rebitzer, 2005: 1327).

In other words, LCM aims to take into account the effects its products have on their environment, all the way from their conception and production to their destruction. LCM is a strategy that was first conceived in Europe and the United States in the late 1960s and had gained popular attention by the 1990s (Russel & Baumann, 2005: 1207). A clear-cut methodology is not yet available for LCM as debates are still raging internationally; what is clear is that the approach must be instituted on a voluntary basis and be adjusted to fit the specific needs and circumstances of the given organization (Rebitzer, 2005: 1328).

One of the main points of contention with LCM is its ability to “generate market value based on ethical values in products” (Seuring, 2004: 6). This can happen in two ways: (1) consumers value environmentally- and socially-friendly products and will choose to purchase them over other more ‘generic’ brands, and (2) the higher price of the product is justified (and perhaps even subsidized by governments in some cases) due to their lower life-cycle costs (Seuring, 2004: 6).

Another issue concerns the practicality of implementing sustainability goals in an organization. Many attempts at life-cycle assessments (LCA) have been made; while most agree that some type of monitoring and evaluation of the program is necessary, the

specific criteria are still debatable (Rebitzer, 2005: 1328). Without any type of evaluation, LCM could stagnate at the rhetorical level, but with the wrong types of measurements, values and actions may be misdirected. Many have also argued that LCA must be readily available to and easily comprehensible by the decision-makers at the given firm; detailed statistics may be too cumbersome or difficult to interpret by those who hold the corporate power (Rebitzer, 2005: 1330). In other words, the simpler the evaluation mode, the easier it is for the corporation to make sustainable and efficient solutions.

With this brief introduction to the concept of LCM in mind, we will now turn to a discussion concerning the manner in which 3M has adopted a LCM policy.

2.2 3M's Approach to LCM

LCM is now a formal part of 3M's production process on a global scale (3M, 2006). 3M is attempting to focus on the "broader impact of products and processes over their entire life cycle", from development to manufacturing, through distribution and customer use, and all the way to the products' disposal (3M, 2006). They implement the strategy based on the following grid:

Life Cycle Stage / Impact	Material Acquisition	R&D Operations	Manufacturing Operations	Customer Needs	
				Use	Disposal
Environment					
Energy / Resources					
Health					
Safety					

Source:

http://solutions.3m.com/wps/portal/3M/en_US/global/sustainability/s/governance-systems/management-systems/life-cycle-management/

The above matrix displays the way in which each part of the production process, from creation to destruction, is taken into account in 3Ms LCM. The grid attempts to take a holistic approach to sustainability by incorporating issues of environment, energy, health, and safety. What is particularly notable is the way in which 3M even ventures to take the consumer/customer side into account in their impact assessments.

By integrating environmental, health, and safety considerations into the design, manufacturing, use, and disposal of their products, 3M states that they are making steps toward achieving their long-term goal of sustainable development (3M, 2006). Attempts are made to consider issues of exposure, incomplete information, and hazardous outcomes on the one hand, but also the potential positive marketing opportunities that arise from producing an environmentally sustainable product (3M, 2006). Though this process is put into motion for each new product 3M invents before its commercialization, the company is also attempting to act retroactively and go through these motions for products that have already been released.

However, questions remain regarding the desirability and effectiveness of 3M's policy. The most easily identified of these issues is that of allocation. Russell and Baumann define allocation as "the partitioning of environmental burdens and other material and energy flows to and from a technological activity between the production for which the activity is used" (2005: 1208). This issue is essentially a methodological problem of deciding where to put the blame. In the case of 3M, if a specific pollution occurs during the use of one of its products, is that pollution considered part of the customer's use or the producer's production? This is an important question when we consider that a certain weighting has to be attached to each category of the life cycle; do

we value environmental sustainability equally across the board or more in the production phase? 3M states that they focus “special attention on those [issues] directly impacting the customer” (3M, 2001). This statement suggests that 3M has already made value judgments that emphasize environmental sustainability at the end of the line. However, this does not negate the necessity of questioning what parts of the associated pollution come from the product itself and what parts come from the inputs required to make the product? For example, if specific glue is required in the production process for post-it notes that causes hazardous off gassing, is this pollution the fault of the input or the product? Is it therefore the responsibility of the glue supplier or the final manufacturer to mitigate the environmental consequences of the product?

This issue brings us to the next problem in 3M’s LCM: how do we aggregate results in order to gauge the aggregate effect over the course of the life-cycle (Russell & Baumann, 2005: 1208)? Some pollution may be counted in volume measures, others necessarily in weight, etc. These measurements become even more complicated if we begin to incorporate (as 3M claims to) measurements of safety and health. How can we combine all these different types of externalities in order to gauge the effect the product’s life cycle is having on the environment? Some thinkers suggest converting each externality into a monetary measure (Russell & Baumann, 2005: 1208). However, how can we put a monetary measurement on the decline in a person’s health? How can we put the social cost of assembly-line labor into monetary measures? It seems that this method is unrealistic. Some would argue that aggregate measures of a product’s effects on the world are irrelevant. However, if one is dealing with a large company like 3M who has the choice between several new products (and assuming the LCM policy is as important

as it appears in their documents), an adequate measure of comparing externalities is necessary. It is not clear at this time how this comparison would be possible.

With this conceptual understanding and brief criticisms in mind, we can now turn to a practical example of 3M's approach to LCM.

2.3 LCM in Practice at 3M

3M presents three 'success stories' on its website designed to exemplify its commitment to sustainability in general, and LCM in particular. One example is the invention of a halogen-free computer cable. Halogen-based compounds contain fluorine, chlorine and bromine and can be found in many insulating and fire-retardant materials, such as computer cables (3M, 2001). When these halogen-based products burn, the by-products are dangerous chemicals like hydrochloric acid, hydrofluoric acid, or hydrogen bromide (3M, 2001). This combustion has toxic effects and produces acidic smoke; it can wreck machinery and impair the ability of those caught in the reaction to escape (3M, 2001). 3M identified the need to redesign such products without halogen as part of their focus on "continually improving the environmental performance of [their] products" (3M, 2001). A new halogen-free compound was developed and introduced, which resulted in lower toxicity and smoke generation, less acidic smoke, and less flammability (3M, 2001).

The above product development is cited as an example of 3M's LCM policy. However, there is no mention of the environmental by-products in the production phase of the new computer cable. Nor is there any mention of the environmental impacts of destroying and/or decomposing the compounds. It is therefore unclear whether this new product is better from a life-cycle point of view, or simply from the point of view of the

consumer who accidentally burns his/her computer cable. This focus on the customer in their publications is not surprising seeing as how, as mentioned previously, 3M has centered its LCM on the customer's phase of the life-cycle.

Therefore, we have seen the advantages of taking a holistic look at the production process: it allows a more accurate capturing of the true environmental effects of a product from its conception to its destruction or decomposing. However, though theoretically this may be true, in terms of assessment, there remain several practical impediments.

Weighting and allocation are two among many. 3M makes no mention of any type of monitoring or continual evaluation tool, which leads one to question whether this LCM is more of a one-off procedure for new products. A skeptic, at this point, would wonder whether 3M's LCM policy is only rhetoric, appealing to the popular trend of producing responsibly.

With this in mind, we will now turn to case studies of 3M's Pollution Prevention Pays program (3P), to explore how LCMs have been combined with the expertise of employees to realize the environmental and economic goals. In each case, if it can be determined that increases in sustainability lead to increased profits for 3M, we will then go on to look at the economic implications of increased environmental legislation in competitive markets.

3. Economic implications of 3M's Pollution Prevention Pays program (3P), and the market-wide implications of tighter environmental regulation

3M began its Pollution Prevention Pays program (3P) in 1975 to recognize employees whose innovations benefited both the environment and the company. Eligible

projects for 3P are those who eliminate or reduce a pollutant, reduce resource and energy use and save the company money. In its 31 years of operation, 3P has increased revenue at 3M by \$810 million and has prevented 1.6 billion pounds of pollution from being released (3M Pollution Prevention, 2006). Several of these successes will be analyzed in this case study in terms of how they increased profits at 3M. Each case study will then be analyzed in terms of how it fits in with current legislation, and then how 3M would be affected if current environmental legislation were to become more lax or more rigid.

Increased profits from sustainability occur when 3M can either avoid or defer the cost of pollution control equipment, reduce material and operating expenses or when increases in sustainability result in increased product sales. These three situations will now be analyzed to examine why selected sample projects have brought about increased profits, and what the long-term implications of these projects are for 3M. Each situation will also be analyzed in terms of the current environmental legislation for these products, and how 3M and its surrounding communities would be affected by tighter legislation. These case studies demonstrate that pollution prevention leads to environmental profits, and that increased environmental legislation is therefore a desirable goal for communities and businesses alike.

3.1- Deferred cost of pollution control equipment

Projects that avoid or defer the cost of pollution control equipment save money by preventing pollution at an early stage instead of dealing with safe capture and disposal at the end of the pipe. 3M has saved over 45 tons of solvent emissions and 125 metric tons of CO₂ per year by replacing a solvent-based treatment process for paper products with a water-based one. This initiative has saved 3M \$850,000 in its first year because it

decreases the cost of maintaining and pollution trapping equipment and cuts the costs of waste disposal (3M Examples, 2006).

The Canadian government has taken steps in part 4 of the Canadian Environmental Protection Act to force metal smelters and refineries to implement pollution prevention plans for toxic chemicals and record their success with Environment Canada. However, enforcement of this policy still remains problematic because flexibility is encouraged in the approach that companies take (Environment Canada, 2004). This policy is therefore catered to the attending corporate stakeholders in many ways, and allows polluting companies to keep polluting at the expense of community health and the environment (Fischer, 2006: 630). Instead, if stricter legislation were to be imposed, environmentally innovative companies such as 3M would be able to maintain operations while polluting plants that are unable to adapt quickly enough would be forced to close, thereby maximizing profit for environmentally innovative companies and encouraging future innovations in this area (Fischer, 2006: 633).

3.2- Reduced material and operating expenses

Innovations that reduce material and operating expenses lead to tremendous savings in operating costs over the long-term. 3M produces a prismatic roadside sign whose production uses 10,587 fewer Btus of energy per yard and creates 65% less process waste than its precursor (3M Examples, 2006). These signs require fewer materials and energy in their production, and are therefore much cheaper to produce than the products of competitors. With this advantage, 3M can either gain larger profit margins over its competitors, or it can lower the price of the product to drive competitors out of business.

However, despite the economic benefits of these types of environmental innovations, companies in Canada are actively discouraged from implementing innovative methods for electricity conservation, due to current subsidies based on their consumption of electricity. The inefficiency created by these subsidies affects regions disproportionately, since high costs for electricity encourage capital-intensive production methods. Regions such as Nova Scotia that lack the economies of scale (urban scale economies) necessary for capital-intensive procedures would therefore benefit even more from policies that limit the amount of electricity and resources a company can use. If subsidies were applied to wage rates instead of resource costs, workers would be better off and environmental innovations would occur in the market place. Once again, environmentally innovative companies would gain a great deal from increased legislation by responding quickly and effectively to new environmental rules.

3.3- Increased product sales

Increased product sales can be generated by corporate focus on sustainability due to products of a better value or higher quality. Moreover, environmentally aware consumers will purchase the resulting product preferentially over less sustainable substitutes. Increased product sales may also result if fewer resources are used or if lower transportation costs result from decreased packaging, for the price of the product can fall below the price charged by competitors, thereby increasing demand for the sustainable alternative (Reinhardt, 2000: 41). For example, 3M redesigned the chemical process through which abrasive backing is created to eliminate nearly all emissions while increasing product value and quality, thereby increasing product sales (3M Examples, 2006).

Encouraging sustainability through higher sales requires that consumers become better educated about the true cost of production for the goods they consume (Hart, 2000: 120). A fundamental paradigm shift is required for businesses that attempt to move away from providing goods to providing the services typically associated with a given good. For example, Interface Carpeting has been highly successful with selling the service of a carpeted floor instead of the carpet itself. This shift allows businesses to gain higher profits, while selling fewer products, by developing a resource efficient method of providing this service that is both more sustainable and more cost effective. Extended producer responsibility is also important for ensuring that increases in sustainability result in increased profits by making it infeasible for companies to squander resources on creating products that cannot be reused. To get back to the 3M case studies, it can be assumed that if extended producer responsibility regulations were applied to the chemical industry, 3M would benefit greatly from increased legislation since they have already begun to develop projects where they take used 3M surgical masks and use them for collecting oil spills.

Therefore, if stricter legislation were applied concerning pollution prevention, companies such as 3M that already use innovations in this area would dominate markets, since companies that could not adapt quickly enough would be at a disadvantage, and could be forced out of business. The impetus on companies would be then for them to compete not only over the value of their product, but also over having a more environmentally friendly production technique. Since environmentally-friendly companies are therefore already more competitive than resource inefficient companies, and have a lower risk of being forced out of business if environmental legislation keeps

getting stricter, we will now look at whether environmentally sustainable companies are already outperforming inefficient companies.

4. Socially Responsible Investing (SRI)

Investments in socially responsible firms are desirable because of the decreased risk and increased profits that can be expected from these investments. By examining selection strategies and performance, SRI funds can be analyzed for their social and environmental values, and returns on investment can be compared between sustainable firms and the standard rates for these indices. Since we have already analyzed the many reasons why companies benefit from being environmentally efficient, we will now focus on whether these economic benefits have been detected in the stock market performance of these companies.

4.1- SRI performance

Socially Responsible Investing is an emerging, growing trend in global financial markets. In the U.S. alone, assets in SRI mutual funds have grown from \$12 billion in 1995 to \$179 billion in 2005 (SIF, 2005: iv). Canada is experiencing similar demand, with an estimated \$65.5 billion of total assets currently in SRI funds (SIO, 2006: 3). Although the SRI market is experiencing tremendous growth, many funds dedicated to SRI are still quite young and untested. We will therefore focus on examining the performance of older and more established investment firms in terms of the performance of SRIs.

VanCity is a financial co-operative that has operated out of Vancouver, British Columbia since 1946. In 1986, VanCity launched Canada's first SRI mutual fund, the

Ethical Growth Fund (EGF). The EGF has established core values in order to define the sustainable corporation. These values include: respect for the environment; respect for stakeholders (employees, communities, customers, and shareholders); and respect for human rights and are gauged using 150 key performance indicators to evaluate the overall social and environmental performance of publicly traded companies (EGF Prospectus, 2006: 6). The EGF's performance since inception is a growth of 8.3% annually, with more recent value returns of 20.1% and 9.1% over the last year and 5 years, respectively (EGF Information, 2006).

Acuity Investment Management is a firm that provides clients with a variety of investment options. Acuity has been a pioneer in the realm of SRI, having established the Acuity Clean Environment Equity Fund (ACEEF) on December 31, 1991 (AIM, 2006). This fund is designed for long-term growth, and incorporates companies that fit the fund's environmental concept of sustainable development. With \$78.8 million in assets, the ACEEF has generated an annual return of 1.4% over the past year, and 8.1% over the past five years (SIO Performance, 2006). In September of 2000, Acuity Investment Management launched the Acuity Social Values Canadian Equity Fund (ASVCEF). This fund invests in primarily large-sized Canadian companies that adhere to standards of "excellence in environmental management" (AIM, 2006). Although young, the ASVCEF has outperformed many other funds, generating 8.2% and 15.5% annual returns over one and five years, respectively, and has grown to \$41.7 million in total assets (SIO Performance, 2006).

In 1999, the Dow Jones Sustainability Index (DJSI) was established to "track the performance of companies that lead the field in terms of corporate sustainability"

(DJSWG, 2006: 4). The index has developed five principles to facilitate the quantification of sustainability performance in corporations: innovative technology; corporate governance; shareholder relations; industrial leadership; and social well being (Cerin & Dobers, 2001: 125). The DJSI has outperformed many other indexes, showing returns of 17.23% and 10.83% annually in the past year and five years, respectively (DJSWIF, 2006: 1).

4.2- Critique of the selection criteria

The selection process for the aforementioned funds is complex, and is prone to controversy because of difficulties in quantifying levels of sustainability, comparing levels of sustainability between different sectors and because of corporate ‘greenwashing’ (Green Life, 2006). ‘Greenwashing’, is a process through which unethical companies create a false façade of sustainable practices to benefit from SRI capital and heightened product demand without taking the necessary steps to achieve sustainability (CopWatch.org, 2006; Green Life, 2006). The process through which companies are declared sustainable will therefore be analyzed to determine the degree to which sustainable companies can benefit from SRIs.

The most common selection criteria for SRIs use exclusionary or inclusionary criteria determined by individual clients (VCIM, 2006). Exclusionary criteria for SRI funds include poor environmental performance and human rights violation (SIO, 2006: 3). Inclusionary criteria include commitments to community involvement, employee relations, and sustainability oriented goals. Since these criteria are often vague and determined based on limited information provided to individual clients, this strategy is highly problematic.

Specific industries are often targeted for investment due to the positive social benefits associated with their production. One such target is the renewable energy sector, which produces energy without harmful emissions. Industry-specific investments can be of great benefit to these sectors, especially when venture capital is provided to encourage new firms to open up in environmentally-friendly industries that are capital-intensive and have high fixed costs, such as renewable energy (SIO Review, 2006: 3).

Shareholder advocacy and corporate management strategies are very popular among SRI funds, for shareholder power can be used to direct corporate performance in a sustainable direction. However, this behavior justifies investments in socially irresponsible firms, with a view to change corporate policy by using the voice that shareholders are entitled to. The ability to influence a firm's policies is limited to the size of the fund's assets, and how much stock can be bought. As the SRI market grows, the funds' power to stimulate sustainable styles of management will increase accordingly. Comprehensive understanding of shareholder advocacy and how to promote sustainable change is required of an SRI mutual fund if they decide to include irresponsible firms in their portfolio. Otherwise, clients are being misled, and are supporting irresponsible firms under a SRI banner, which effectively negates the benefits for businesses of investing in sustainable practices.

4.3 – Performance of sustainable responsible funds (3M)

Individual firms that practice sustainability management have recently performed well in terms of stock market valuation. The best examples are 3M (NYSE: MMM) and Interface Inc. (IFSIA). 3M has shown tremendous long-term growth since it went public in 1970. From an IPO of about \$7, the share price has seen sustained growth to the

present day price of \$80.41 (Yahoo, 2006). Although many factors have contributed to this rise, LCM and sustainable cost-cutting measures have certainly aided the company's growth. Interface Inc. (NASDAQ: IFSIA) has also noticed the effects of sustainable management on their stock price. Following a split in 1998, the share price fell sharply, in large part due to the fixed costs associated with a shift toward sustainable management. These fixed costs are spread out over time, and the average cost of production falls due to greater energy efficiency and sustainable production processes. Accordingly, the stock price has risen from a low of about \$2.50 in 2003 to its current price of \$15.22 (Yahoo, 2006).

Companies such as 3M and Interface, who employ sustainable management systems and who are committed toward corporate responsibility for the entire life cycle of their products should see greater valuation on sustainability investment for two very good reasons: (1) sustainability management creates a positive work environment, fostering a sense of well-being throughout the organization, enhancing the lives of its workers, managers, customers, and stakeholders; (2) anticipating government policy shift toward environmental stewardship in the face of climate change and other ecological disasters, sustainable companies will have an advantage in the movement of production away from products with harmful life-cycles toward sustainable LCM. As a result, greater environmental sustainability leads to better performance in stock markets.

5- Conclusion:

Enhanced sustainability for individual businesses can therefore result in increased profits and lowered long-term risk, which both result in enhanced performance in the

stock market. Tighter environmental legislation benefits environmentally conscious companies, and places on them the impetus to continue pursuing environmental innovations. The companies that do remain ahead benefit from the multiple economic benefits of sustainability, and governments would have to spend less money overall on subsidizing the resource consumption of various industries and less on the health costs and remediation strategies that follow unsustainable business practices. It is therefore economically feasible, and desirable in the long-term, for market-wide environmental legislation to be tightened up. It is also imperative that research efforts be directed to further innovations in LCMs, and in developing a better knowledge of industrial ecology.

References

- 3M. (2006). *3M's life-cycle management policy*. Retrieved 11/19, 2006 from http://solutions.3m.com/wps/portal/3M/en_US/global/sustainability/s/governance-systems/management-systems/lcm-policy
- 3M. (2001). *Interconnect solutions division's halogen-free cable insulation reduces risk*. Retrieved 11/20, 2006 from http://solutions.3m.com/3MContentRetrievalAPI/BlobServlet?locale=en_US&univid=1046797071561&fallback=true&assetType=MMM_Image&blobAttribute=ImageFile&placeId=1108&version=current
- 3M. (2006). *Pollution Prevention*. Retrieved 11/10, 2006 from <http://www.3m.com/about3m/pioneers/ling.jhtml>
- 3M. (2006). *Pollution Prevention Pays Examples*. Retrieved 11/10, 2006 from http://solutions.3m.com/wps/portal/3M/en_US/global/sustainability/s/governance-systems/management-systems/3p-examples
- Acuity Investment Management (2006). *Acuity Clean Investment Equity Fund*. Retrieved 11/29, 2006 from <http://www.acuityfunds.com/Acuity/AcuityWeb2001.nsf/7e542818dc0bdfb8852568cd004ceee8/118b43e0d75ae57685256e00006cee54?OpenDocument>
- Brent, A.C. & Visser, J.K. (2003). An Environmental Performance Resource Impact Indicator for Life Cycle Management in the Manufacturing Industry. *Journal of Cleaner Production*, 13, 557-565.
- Cerin, Pontus & Dobers, Peter. (2001). What Does the Performance of the Dow Jones Sustainability Index Tell Us? *Eco-Management and Auditing*, 8 123-133.
- Cerin, Pontus & Dobers, Peter. (2001a). Who is Rating the Raters? *Corporate Environmental Strategy*. Volume 8, Issue 2: Elsevier Science Inc.
- Dow Jones Sustainability. (2006). World Guide. Version 8.0, August.
- Ethical Funds Company. (2006). *Ethical Funds Simplified Prospectus*. Retrieved 11/29, 2006 from http://www.ethicalfunds.com/pdf2/investor_resources/reports_investor_materials/simplified_prospectus_06_2006.pdf
- Ethical Funds Company. (2006). *Information*. Retrieved 11/29, 2006 from http://www.ethicalfunds.com/do_the_right_thing/our_funds/individual_funds/egf.asp
- Ethical Funds Company. (2006). *Fund Fact Sheet*. Retrieved 11/29, 2006 from

http://www.ethicalfunds.com/pdf2/investor_resources/reports_investor_materials/fund_fact_sheet_egf.pdf

- Fischer, P. (2006). Canadian federal government requirements and support tools for pollution prevention planning. *Journal of Cleaner Production*, 14(6), 629-635.
- Environment Canada. (2004). Response to Comments on the Proposed Notice Requiring the Preparation and Implementation of Pollution Prevention Plans in Respect to Specified Toxic Substances Released from Base Metals Smelters and Refineries and Zinc Plants under the Canadian Environmental Protection Act, 1999. *Canadian Gazette*. Part 1.
- Hart, Stuart L. (2000). Beyond greening: strategies for a sustainable world. In *Harvard business review on businesses and the environment* (pp. 105-130). Boston: Harvard Business School Press.
- Hunkeler, D., G. Rebitzer, A. Inaba (2003). Environmental Performance Indicators and Application of Life Cycle Thinking to Product Development and Corporate Management. *Int J LCA* , 8(1), 55-58.
- Interdepartmental Working Group on Corporate Social Responsibility (2000). *CSR Case Study: Vancity Guided by Values*. Retrieved 11/29, 2006 from http://www.nrcan-rncan.gc.ca/sd-dd/pubs/csr-rse/pdf/cas/vancity_e.pdf
- Rebitzer, G. & Buxmann, K. (2005). The Role and Implementation of LCA within the life cycle management at Alcan. *Journal of Cleaner Production*, 13, 1327-1335.
- Reinhardt, F.L. (2000). Bringing the environment down to earth. In *Harvard business review on businesses and the environment* (pp. 35-58). Boston: Harvard Business School Press.
- Russel, A. & Baumann, H. (2005). Life Cycle Assessment – Introduction and Overview. *Journal of Cleaner Production*, 13, 1207-1210.
- Seuring, Stefan (2004). Emerging Issues in Life-Cycle Management. *GMI Theme Issue*, 45, 3-6.
- Social Investment Forum (2006). *2005 Report on Socially Responsible Investing Trends in the United States*. Retrieved 11/29, 2006 from http://www.socialinvest.org/areas/research/trends/sri_trends_report_2005.pdf
- Social Investment Organization (2006). *SRI Institutional Investment Directory Asset Managers & Investment Consultants*. Retrieved 11/29, 2006 from <http://www.socialinvestment.ca/SIReview04.pdf>
- Social Investment Organization (2006). *Socially Responsible Investment Funds*

in Canada. Retrieved 11/29, 2006 from
<http://www.socialinvestment.ca/documents/SRIMutualFundsSept2006.pdf>

The Green Life (2006). *Greenwash 101*. Retrieved 11/29, 2006 from
<http://www.thegreenlife.org/greenwash101.html>

VanCity Investment Management Inc. 2003). *Investing With Discipline*. Retrieved
11/29, 2006 from http://www.vcim.ca/pdfs/VCIM_Brochure.12.03.pdf

Yahoo Finance (2006). *3M Co. (MMM)*. Retrieved 11/29, 2006 from
<http://finance.yahoo.com/q?s=MMM>

Yahoo Finance (2006). *Interface Inc. (IFSIA)*. Retrieved 11/29, 2006 from
<http://finance.yahoo.com/q?s=IFSIA>