

## Why Do Firms Invest in Capital Expenditures? Evidence from Environmental Activities

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### Abstract

*Capital expenditures comprise one of the largest and riskiest accounts in corporate financial statements. An understanding of motivators for capital investment decisions is valuable for investors, regulators, auditors, and the public at large. I provide empirical evidence of environmental activities as one such motivator. This analysis is particularly important given the unprecedented attention to environmental accountability in today's business world. Using a sample of 2,474 observations from US firms from 2004 to 2006, I find that firms engaged in environmental activities report significantly higher capital expenditures than those that do not. I also independently examine various types of environmental activities and find consistent results. My findings support environmental initiative participation as a driver of firm capital investment, and I discuss the implications of these findings for various stakeholders.*

**Key Words:** Capital expenditure, corporate social responsibility, environmental activities, environmental performance.

**Data Availability:** All data are available from public sources.

### 1. Introduction

Capital expenditures often comprise one of the most significant accounts in a firm's financial statements, averaging \$1.1 trillion per year (US Census Bureau, 2007). Additionally, this account is considered one of the riskiest, subject to material restatements and financial fraud (Maremont and Cohen, 2002; Pulliam and Solomon, 2002; Audit Analytics Inc., 2008, Beasley, 2010). Furthermore, capital expenditures have long been shown to significantly affect the value and very survival of a firm (Tobin, 1969; Yoshikawa, 1980; Hayashi, 1982; Abel, 1983). Given these factors, an understanding of firm capital investment activity is critical to many stakeholders. This study specifically examines such activity as it relates to firm environmental performance, an area receiving heightened attention in our increasingly eco-conscious world. The past twenty years have seen an unprecedented market growth in socially and environmentally responsible funds and indices, expanding in investment from \$639 billion to \$2.71 trillion. As firms recognize this increased market attention on social and environmental issues, the number of companies engaging in activities to increase accountability has also increased drastically (Social Investment Forum, 2010).

Given that capital expenditures and environmental activities both have significant influence on the overall economic and social welfare of society (Harris and Raviv, 1996; Brammer and Pavelin, 2006), I examine types of capital expenditures for firms with and without environmental initiative participation to shed further light on capital investment in our evolving times. The examination of specific corporate environmental activities has been limited, largely due to a lack of data availability (Cho et al., 2012; Johnston, 2005). I overcome this through utilization of a highly regarded corporate social responsibility database by KLD Research & Analytics, Inc. (KLD). Capital expenditure information is required GAAP disclosure available in the Compustat database. Taken together, I describe and examine a range of firm environmental activities and analyze levels of capital expenditure based on these activities to provide evidence on potentially important drivers of firm capital investment.

While it may seem evident that environmental activities require capital resources, an empirical comparison is important and valuable. Accounting treatment of capital expenditures involves considerable managerial judgment and discretion. This is even truer for those that relate to environmental initiatives given the high level of uncertainty surrounding their potential future benefits, which can range from short to long-term, or yield none at all. Managers are practicing discretion in this area all the time, and this study seeks to shed valuable empirical light on these decisions with regard to the treatment of environmental initiative costs as capital expenditures. Additionally, different types of environmental activities are bound to require varying levels of capital expenditure, which I also examine empirically. Thus, I attempt to better inform market participants and key stakeholders of financial reporting implications of overall environmental initiative participation, and of various specific environmental activities.

The results of my analysis show that firms undertaking environmental initiatives do, in fact, report significantly higher capital expenditures. With regard to specific financial activities, I find initiatives related to environmentally friendly products and services, recycling, pollution prevention, climate control, and other activities such as management systems, voluntary programs, and other environmentally proactive activities to all demand significant capital resources. These findings add empirical insight to an increasingly important environmental motivation for firm capital investment. They can also assist investors, regulators, auditors, and others interested in understanding the financial implications of a firm's environmental initiatives. In the remainder of the paper, I provide a literature review, empirical analysis, results, and a discussion of the study's implications in order to shed critical light on environmental activity as a driver of firm capital expenditures in today's age.

## **2. Prior Literature**

Extant literature has examined environmental capital expenditures as they relate to a range of economic consequences. Clarkson et al. (2004) find a positive market reaction to environmental capital expenditures, but only for low polluting firms. Johnston (2005) finds regulatory environmental expenditures to have negative market consequences but positive financial reporting quality consequences, and voluntary environmental expenditures to have no such effects. Most recently, Wirth et al. (2013) interestingly find capital expenditures subject to environmental regulatory delays to provide greater competitive advantage, with investors reacting positively to the announcement of such delays. They also find that investors value the information provided in environmental disclosures. This study looks at environmental activity as a factor in capital investment decisions, thus adding value to these studies by examining the front end of environmental capital investment, and evaluating various environmental activities from this perspective.

Another relevant stream of research examines the impact of environmental regulation on capital investment. Leither et al. (2011) find a positive but diminishing association between environmental regulation and capital investment using a sample of European industries. MacDermott (2009) finds level of foreign direct investment to be negatively related to the level of environmental regulation in a study of twenty-six nations. Gray and Shadbegian (1998) also examine investment decisions based on the environmental regulatory environment. They report that US paper mills opening in states with more stringent environments choose cleaner production technologies, and they also show evidence of shifting capital investment towards less stringent environments. Finally, Wood and Ross (2006) study how environmental social controls such as mandatory disclosure, regulations, subsidies, and stakeholder opinion affect managerial capital investment decisions. They find stakeholder opinion to have the greatest effect, and mandatory disclosure to have the lowest. While these studies yield important insights into the regulatory environmental and control considerations of environmental capital investment, this study evaluates a range of environmental initiatives as they relate to reported capital expenditures to provide firm-level financial reporting implications of various environmental activities.

A common theme in extant literature is a lack of publicly available objective data on corporate environmental activities, and details on specific types of initiatives. I overcome this problem by utilizing environmental data provided by KLD to further advance our understanding of the financial reporting consequences of environmental activities. KLD independently rates companies trading on U.S. stock exchanges on a range of social performance dimensions, including the environment (KLD, 2006).<sup>1</sup>

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<sup>1</sup> Other dimensions of social performance data in KLD include community, diversity, employee relations, and human rights (KLD, 2006).

The KLD database is widely used and considered highly reliable due to the independence of KLD analysts, the objective screening criteria used to rate firms, the consistency with which ratings are applied across companies, and the wide range of sources used to obtain the data (Waddock and Graves, 1997; Hillman and Keim, 2001; Dhaliwal et al., 2011). This range of sources includes proxy statements, government documents, surveys, peer-reviewed legal publications, and the mainstream media (KLD, 2006). This database is becoming a common source of environmental data in accounting research, and its benefits outweigh its limitations (e.g., Cho et al., 2006, 2010; Dhaliwal et al., 2010; 2011).

### **3. Environmental Activities and Capital Expenditures**

A firm invests in capital expenditures to achieve its objectives. In today's evolving business world, these objectives are bound to increasingly reflect the growing public emphasis on social and environmental accountability. In fact, a decision-making experiment by Wood and Ross (2006) reveals stakeholder opinion as the primary consideration in firm environmental capital expenditure decisions. Accordingly, a firm will have to make considerations of environmental activities in its capital investment decisions. Such considerations have been echoed by regulatory bodies. The Securities and Exchange Commission (SEC) specifically describes the imperative for firms to consider the impact of its environmental activities on capital expenditures when constructing its financial statements and related disclosures (SEC, 2010). Additionally, Item 101 of Regulation S-K calls for firms to consider and disclose material current and future capital expenditures made for certain environmental controls.

Business media has also recognized these factors of capital investment decisions. The *Wall Street Journal* reports many instances of increased capital expenditures as a result of environmental activities. In its 40th Anniversary of Earth Day Special Report issue, the *Journal* documents corporate environmental initiatives and related investments in environmental capital projects to date as far back as 1973 (Plank, 2010). It also highlights several major capital investments for environmental initiatives, most recently reporting governmental outlays of over \$25 billion to help auto-makers significantly retool plants for electric car manufacturing and carbon footprint reduction (Mitchell, 2010). We also see anecdotal evidence of environmental capital expenditures in corporate financial statements over the period of study. For example, ChevronTexaco Corporation's Business and MD&A sections of its 10-K discuss its environmental projects associated with increasing air and water quality, and report related material capital expenditures of \$145 million in 2004 (ChevronTexaco, 2004). These capital expenditures due to environmental initiatives continued to grow significantly – up to \$213 million in 2005, and \$385 million in 2006 (ChevronTexaco, 2005; 2006).

Taken together, this regulatory and anecdotal information suggests increased capital expenditure as a result of environmental activity. This leads us to expect that firms engaging in environmental activities will report significantly higher capital expenditures. Furthermore, I analyze capital expenditures by type of environmental activity. While I anticipate capital resource requirements across environmental initiative types, the magnitude may not be as clear due to the varying nature, complexity, and financial statement implications of different types of environmental activities. I suggest that a firm's investment in capital resources differ based on the type of initiative. I examine five types of environmental activities provided by KLD. The first reflects firm use and/or development of environmentally friendly products and services (PROD\_SERV) Given the shift in consumer buying criteria toward environmental responsibility, firms are willing to invest in green product and service initiatives to provide a distinct competitive advantage (Laroche et al., 2001). Such initiatives may be as simple as using greener raw materials, or may be as complicated as complete replacement of fixed assets to ensure more efficient, eco-friendly processes. The second activity denotes use of substantial recycled materials (RECYCLE). Such initiatives can involve minor changes in existing routines, or radical changes in the way a company does business, requiring capital investments in new technologies, product or process redesign (Epstein and Roy, 2001).

The third and fourth environmental activities, most directly related to reducing a firm's carbon footprint, relate to notably strong pollution prevention programs (POLL\_PREV) and commitment to reducing the impact on climate change (CLIMATE). These activities require firms to demonstrate substantial reductions in emissions and toxic waste and practice energy efficiency, such as the use of renewable energy and clean fuel. The closer a firm gets to 'zero-pollution', the more expensive it gets due to rising capital and technology investments (Hart and Ahuja, 1996). In order to achieve these eco-friendly goals, firms may have to materially modify fixed assets or processes, requiring significant capital expenditures.

Furthermore, these initiatives may pertain directly to meeting stringent Environmental Protection Agency (EPA) specifications and guidelines, a motivation for substantial commitment to capital investments.

The last environmental activity pertains to firms displaying a superior commitment to management systems, voluntary programs, and other environmentally proactive activities (OTHER). Such initiatives may serve more of a support function as opposed to requiring significant tangible capital resources, or alternatively, they may require significant capital expenditures if companies undertake substantial efforts to enhance their operating and management systems for the long-term. Proactive companies have been shown to make considerable investment in technologies and management practices to reduce environmental impact (Sharma and Vredenburg, 1998). In order to add clarity and concrete application of these activities, I provide real financial statement examples of each type of initiative in Table 1. Given the differences in nature between these five types of environmental activities, I will explore their implications by examining the level of capital expenditure for firms with and without such initiatives.

**Table 1: Examples of Environmental Activities**

<b>Initiative Type</b>	<b>Company</b>	<b>Example</b>
<b>Environmental Products and Services (PROD_SERV)</b>	<b>Waters Corporation</b>	The Company's Waters instruments (LC and MS) are utilized in this broad range of industries to detect, identify, monitor and measure the chemical, physical and biological composition of materials as well as to purify a full range of compounds. These instruments are used in drug discovery and development, including clinical trial testing, the analysis of proteins in disease processes (known as "proteomics"), food safety analysis and environmental testing.
<b>Pollution Prevention (POLL_PREV)</b>	<b>3M Company</b>	Capital expenditures for environmental purposes have included pollution control devices — such as wastewater treatment plant improvements, scrubbers, containment structures, solvent recovery units and thermal oxidizers — at new and existing facilities constructed or upgraded in the normal course of business. Consistent with the Company's policies stressing environmental responsibility, capital expenditures... for known projects are presently expected to be about \$20 million over the next two years for new or expanded programs to build facilities or modify manufacturing processes to minimize waste and reduce emissions.
<b>Recycling Initiatives (RECYCLE)</b>	<b>Trex Company, Inc.</b>	Through capital investments and process engineering, we continuously seek to lower the all-in cost to manufacture Trex products. Investments in plastic recycling capabilities will allow us to expand our ability to use a wider breadth of waste streams and as a result lower our raw material costs.
<b>Climate Protection (CLIMATE)</b>	<b>FPL Group, Inc.</b>	As a participant in President Bush's Climate Leader Program to reduce greenhouse gas intensity in the United States by 18% by 2012, FPL Group has inventoried its greenhouse gas emission rates and has committed to a 2008 reduction target of 18% below a 2001 baseline emission rate measured in pounds per megawatt-hour. FPL Group believes that the planned operation of its generating portfolio, along with its current efficiency initiatives, greenhouse gas management efforts and increased use of renewable energy, will allow it to achieve this target. In addition, FPL Group has joined the U.S. Climate Action Partnership, an alliance made up of a diverse group of U.S.-based businesses and environmental organizations, which in early 2007 issued a set of principles and recommendations to address global climate change and the reduction of greenhouse gas emissions.
<b>Other Environmentally Proactive Initiatives (OTHER)</b>	<b>The Dow Chemical Company</b>	Dow is committed to world-class environmental, health and safety ("EH&S") performance, as demonstrated by a long-standing commitment to Responsible Care®, the significant progress made by the Company over a 10-year period toward Dow's EH&S Goals for 2005, and the development of Dow's new 2015 Sustainability Goals. In 2005, Dow developed its next generation of 10-year goals that will provide continuity to the first set of goals, while also addressing a broader set of challenges. The 2015 Sustainability Goals will set the standard for sustainability in the chemical industry by focusing on improvements in Dow's local corporate citizenship and product stewardship, and by actively pursuing methods to reduce the Company's environmental impact.

#### 4. Sample and Descriptive Statistics

Using the KLD database, I identify US firms that engage in environmental activities. I use three years of data from 2004 through 2006 since KLD restructured some of its data in prior years thus affecting comparability. After obtaining the capital expenditure data for these observations from Compustat, the final sample consists of 2,474 observations. In Table 2, I present frequencies of the five types of environmental activities for the full sample and for firms that participate in environmental activities. We see that climate control related activities (CLIMATE) are by far the most common for this sample firms, occurring almost twice as much as the next highest activity related to environmentally friendly products and services (PROD\_SERV). Other activities which display a superior commitment to management systems, voluntary programs, and other environmentally proactive activities (OTHER) and pollution prevention measures (POLL\_PREV) follow just behind, and recycling activities (RECYCLE) are the lowest occurring activity in the sample.

**Table 2: Frequency of Environmental Activities**

<u>Type of Activity</u>	<u>Number</u>	<u>% of Full Sample</u> <u>(n = 2,474)</u>	<u>% of Firms with</u> <u>Environmental Activities</u> <u>(n = 280)</u>
PROD_SERV	67	2.71%	23.93%
RECYCLE	39	1.58%	13.93%
POLL_PREV	54	2.18%	19.29%
CLIMATE	110	4.45%	39.29%
OTHER	57	2.30%	20.36%

#### 5. Results and Discussion

In order to determine if firms with environmental activities have significantly higher levels of capital expenditures, I conduct a test of differences of the means between firms with and without environmental activity participation, and individually for each type of initiative. I use the natural logarithm of capital expenditures in these tests and note consistent findings when standardizing capital expenditures by total assets. Table 3 reports the results of these tests. I find that capital expenditures are, in fact, significantly higher ( $p < 0.01$ ) for firms that participate in environmental activities relative to those without environmental activities, supporting my primary prediction. I also report the results of each type of activity as it relates to capital expenditures. I find that each type of environmental activity is associated with significantly higher levels of capital ( $p < 0.01$  for RECYCLE, POLL\_PREV, CLIMATE, and OTHER;  $p < 0.10$  for PROD\_SERV). This finding suggests capital resource requirements for all types of environmental activities, further supporting my initial expectation of environmental activity as a driver of firm capital expenditures.

**Table 3**

**Test of Differences in Capital Expenditures (LNCAPEX) for Full Sample and for Firms with and without Environmental Activities**

<u>Environmental</u> <u>Activities</u>	<u>Firms with</u> <u>Environmental</u> <u>Activities</u> <u>(n = 280)</u>		<u>Firms without</u> <u>Environmental</u> <u>Activities</u> <u>(n = 2,194)</u>		<u>Test of</u> <u>Differences</u> <sup>b</sup>
	<u>Mean</u>	<u>Std. Dev.</u>	<u>Mean</u>	<u>Std. Dev.</u>	<u>t-statistic</u>
Participation <sup>a</sup>	5.39	1.52	3.99	1.48	13.32***
PROD_SERV	4.63	1.75	4.29	1.76	1.57*
RECYCLE	5.81	1.43	4.27	1.76	6.64***
POLL_PREV	5.98	1.44	4.26	1.75	8.62***
CLIMATE	6.59	1.30	4.19	1.71	18.56***
OTHER	6.26	1.40	4.25	1.75	10.64***

This table presents the mean, standard deviation, and test of differences in capital expenditures for firms with and without environmental activities.

\*\*\*, \*\*, \* denote significance at the 0.01, 0.05, and 0.10 levels, respectively.

<sup>a</sup>This group denotes firms that participate in at least one environmental activity.

<sup>b</sup>Test results are identical when I use non-parametric tests.

These results are consistent with the assertion that firms undertaking environmental activities report significantly higher capital expenditures, a finding that holds true for each individual activity type examined. Thus, I provide empirical evidence of a driver of capital expenditure investment that will only become increasingly important in our evolving age of greater emphasis on social and environmental accountability. In addition to providing this initial empirical support with great potential for future research, these findings can assist investors, regulators, auditors, and others interested in understanding factors of capital investment decisions and financial implications of firm environmental activities.

For example, investors can make more informed investment decisions with a better understanding of free cash flow given that firms engaged in environmental activities appear to incur significant capital expenditures which may yield relatively lower free cash flow than firms without similar levels of environmental initiative. Furthermore, because environmental activities can have a significant detrimental effect on cash flows, excessive participation may place a firm in financial distress, a possibility that this study makes more foreseeable to investors. Regulators such as the SEC can benefit from this study as it provides empirical evidence on its assertion that corporate environmental activities can have a material impact on capital expenditures (SEC, 2010), and sheds further light on the varying magnitude of this impact based on initiative type. For auditors, when examining capital expenditures, they can gather and analyze evidence not only on capital expenditure transactions, but also on underlying environmental initiative projects. A greater understanding of the nature and expected short and long term benefits of initiatives can assist auditors in making more informed assessments of client-related business and financial reporting risks, and of proper classification of expenditures as capital. Whether all or some of the outlays of environmental activities should be fully or partially capitalized because of the risk and uncertainty surrounding environmental initiatives presents an important audit issue. And lastly, all stakeholders can benefit from a deeper understanding of the resource requirements and reporting choices related to the increasingly “hot topic” of environmental performance. This study presents an opportunity for future research to delve even deeper into this topic, which is undoubtedly of increasing interest to today’s business community.

## **6. Conclusion**

Capital expenditures comprise one of the largest and riskiest accounts in corporate financial statements (US Census Bureau, 2007; Maremont and Cohen, 2002; Pulliam and Solomon, 2002; Audit Analytics Inc., 2008, Beasley, 2010). Such expenditures have long been shown to significantly affect the value and very survival of a firm (Tobin, 1969; Yoshikawa, 1980; Hayashi, 1982; Abel, 1983). Accordingly, an understanding of motivators of capital investment is essential to investors, regulators, auditors, and the public at large. I seek to enhance this understanding by providing empirical evidence of environmental activities as a driver of firm capital expenditures. This evidence is increasingly relevant as social and environmental accountability is receiving unprecedented attention from the business world (e.g., Mitchell, 2010; Plank, 2010; Social Investment Forum, 2010).

Using a sample of 2,474 firm-year observations from US firms from 2004 to 2006, I find that firms engaged in environmental activities have significantly higher capital expenditures than firms that do not. I find this result to persist across individual activities related to environmentally friendly products and services, climate control, recycling, pollution prevention, and management systems, voluntary programs, and other environmentally proactive activities. These findings have important implications for various stakeholders seeking a greater understanding of capital investment decisions and financial reporting implications of firm environmental activities. This study also opens up many opportunities for future research into the influence of environmental activity on capital investment decisions and financial reporting. In today’s age of unparalleled emphasis on corporate social and environmental accountability, the importance of such topics cannot be overstated.

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