Managing Environmental Risk and Investment Opportunities to Maximize Shareholder Wealth

Abstract. This article discusses the opinions of environmental experts, corporate strategy, policies, and analytical tools for companies to manage environmental risk and investment opportunities to maximize shareholder wealth. Policies and procedures helpful for evaluating (1) “cost reducing environmentally beneficial investment opportunities” and (2) “environmental contamination clean up options” are discussed and illustrated in detail. As the application of capital budgeting procedures is often the appropriate analytical approach, cash flow forecasting and risk estimation, the foundation of good capital budgeting analysis, is also discussed and illustrated.

Introduction

At the Industrial Development Research Council (IDRC) World Congress, held in Colorado Springs in May 1990, many in attendance were inspired by the excellent speakers who addressed The Environmental Challenge for Corporate Real Estate Asset Management in the 1990s. It was particularly encouraging to hear two of the keynote speakers, Mr. Paul Orefice, Chairman of the Board of Dow Chemical, and Amory Lovins, Director of Research of the Rocky Mountain Institute, say that taking corporate action to protect our environment is not necessarily at the expense of a company’s stockholders. Mr. Orefice stated that a lot of pollution is the result of lost production efficiencies and that new technologies are continually being sought to prevent this waste. Mr. Lovins illustrated how improving production efficiency by reducing electric energy consumption can both reduce corporate operating costs and eliminate the pollution generated by burning the fossil fuels required to produce that amount of electric energy.

While much was said during this IDRC World Congress to persuade corporate real property managers that current social trends will require them to be more concerned in the future about preserving the quality of our environment, it still remains to be explored just how an “environmentally conscious” corporate real property manager can make use of existing management tools to integrate environmental issues with corporate investment policies and objectives. This article offers corporate real property executives some guidelines for evaluating both environmental risks, and investment opportunities that benefit our environment, within the capital budgeting framework.

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Theoretical Background

Central to current management theory is the premise that a corporate real property executive should manage his/her company's real assets so as to maximize the price of the company's common stock (i.e., maximize the wealth of company shareholders). The literature tells us that corporations achieve this goal when they undertake project opportunities, or make any corporate choice for that matter, which results in the highest Net Present Value (NPV) when evaluated with capital budgeting procedures. When doing capital budgeting analysis, the relative desirability of every corporate real property decision, regardless of whether it impacts upon the environment, is ultimately based on that decision's impact upon a company's forecasted cash flows and the level of risk associated with these cash flows.

Identifying Profitable Environmental Investment Opportunities

There appears to be two types of corporate decisions that impact upon both the quality of our environment and shareholder wealth. One type of corporate decision, which will be investigated first, seeks to identify profitable business opportunities that have a favorable impact on the environment. The second type of corporate decision seeks to reduce costs associated with "cleaning up" the adverse impacts upon our environment of "being in a particular business".

The first type of decision, which seeks to identify profitable environmentally sensitive business opportunities that will add to shareholder wealth, may involve long-term investment of corporate resources, or it may merely increase annual operating cash flows without the requirement of an initial long-term investment. Whether or not long-term investment of corporate capital is required, this first type of corporate environmental decision seeks to increase the future cash flows of the company (either through reducing expenses or increasing revenues) by an undertaking that also has a positive impact upon the environment. The example provided by Amory Lovins was that of a company investing in electricity-saving equipment that would pay for itself plus interest through the cost savings achieved over time from reducing the amount of electricity required to produce a product. Another example would be that of an investment in a facility that enables utilities to convert industrial waste heat to "home" use.

To illustrate applying capital budgeting techniques to this first type of environmentally related corporate decision, where long-term investment is required "up front," let's say that a company is evaluating a more efficient production layout that will reduce the electricity required to fabricate its products by $300,000 a year over the next ten years. If implementing this more energy-efficient production layout costs $1,000,000, and the company's weighted average cost of capital is 15%, the total increase in shareholder wealth achieved by adopting this new energy-efficient layout would be $505,630. (The $505,630 increase in shareholder wealth, which is also the project opportunity's NPV, is calculated by taking the present value of the $300,000/year savings in electricity over the next ten years [1,505,630] and subtracting the initial long-term investment cost [$1,000,000] to change the new production layout.) If this same company had 100,000 shares of its common stock outstanding, stockholders should see the price on each of their shares of common stock increase by $5.05 ($505,630/100,000 shares) given an efficient market.
More and more, corporate long-term investment decisions involve environmental issues that need to be quantitatively evaluated by properly applying capital budgeting procedures. Consequently, investment decisions regarding production processes, new product (or service) introduction, engineering design, new plant and equipment purchases, acquisition or sale of corporate real property assets, and acquisitions and divestitures of whole businesses, are more and more likely to raise environmental issues that require good environmental information upon which meaningful cash flow estimates of the related costs and benefits can be made.

Different from other long-term investment opportunities, companies often find it more difficult to gather adequate information to satisfactorily forecast cash flows related to environmental investment opportunities. There are several reasons for this. First, much of today’s information on environmental investment opportunities is new, specialized, technical, not widely disseminated, and fast-changing. Secondly, each company’s environmental investment opportunities, as well as environmental risks, are somewhat unique and dependent upon that corporation’s assets and lines of business. Third, because of this uniqueness, substantial custom analysis, design and other services may have to be purchased before cash flow costs and benefits can be adequately estimated. Fourth, environmental information sometimes must be gathered in a short time due to the circumstances surrounding the investment opportunity (e.g., “due diligence” investigation of acquisition candidate). Lastly, finding knowledgeable, reputable, and capable firms, able to assist in estimating the cash flows needed for quantitative analysis, can be very difficult. George Pilko, President of Pilko and Associates, an environmental risk consulting firm, attributes the shortage of qualified environmental consultants to the long period of experience needed (i.e., twenty years) before a consultant can adequately identify corporate environmental risks.

Where there remains above average uncertainty in the forecasted cash flows for a prospective environmental investment opportunity, capital budgeting procedures require that analysts compensate for this higher cash flow uncertainty, the same as if the project opportunity, itself, is more risky. The most common capital budgeting procedure used to compensate for above-average project risk, is to discount these higher risk cash flow benefits at a higher “risk-adjusted” weighted average cost of corporate capital. A less widely used method to compensate for higher than average risk cash flows, but equally satisfactory, is the “certainty-equivalent” approach. Under this second method, the dollar amount of the less reliable estimates of cash flow benefits are reduced by means of “certainty equivalent coefficients” to the point of indifference to yield new “certain” cash flow estimates. Then, this stream of “certainty equivalent cash flows” is discounted at the risk-free rate (i.e., T-bills). Both of these methods of compensating for less certain estimates of cash flow benefits reduce the likelihood of an investment opportunity, or decision, being undertaken.

One way corporate real estate managers have gathered more reliable information for estimating environmental project cash flows is to expand their network of “acquaintances” that include (1) reputable vendors of environmental information, equipment, and services as well as (2) other corporate managers that have faced similar environmental opportunities and risks. Sometimes, it is useful to perform a preliminary capital budgeting analysis to help judge whether a rough estimate of the cash flow benefits of an environmental investment opportunity justify the time and out-of-pocket costs required to gather the necessary information to make a more accurate cash flow forecast.
Minimizing Costs and Risk of Environmental Cleanup

The second type of corporate decision that impacts upon both the environment and shareholder wealth relates to corporate compliance with environmental laws and regulations. These decisions usually involve the cleanup of prior environmental contamination. With today’s costs to clean up past contamination rising at three to four times the rate of inflation, these same cleanup costs have also been rising about twice the rate of a company’s cost of capital. Under present laws, which almost always hold companies responsible for past pollution on their land, even after it is sold, most companies do not need capital budgeting analysis to know that their shareholders are better off when environmental contamination is cleaned up as soon as possible. This is the case because the present value of future cleanup costs will always exceed the cost of cleanup today when the rate of increase in cleanup costs exceeds a company’s cost of capital.

Nevertheless, capital budgeting analysis can be quite useful for evaluating environmental cleanup under certain circumstances. For example, if the forecasted rate of increase in environmental cleanup cost should drop below a company’s cost of capital (i.e., less than twice the inflation rate), then capital budgeting analysis might indicate that shareholders are better off to wait before cleaning up an environmental problem. Or possibly, changes in present laws might permit the shifting of responsibility for environmental problems such that an existing property owner could transfer full responsibility to another party. In addition, a smaller company with limited resources may not be able to undertake cleanup of an environmental problem without its being acquired by a stronger financial partner. In situations such as these, where it might appear economically beneficial to delay environmental cleanup, capital budgeting methodology can be applied to determine if such a delay is really in the best interests of shareholders.

To illustrate this, let’s assume that Medtek Chemicals is faced with the following toxic waste cleanup situation: (Keep in mind that present federal laws hold sellers responsible for subsequent environmental damage and toxic waste cleanup, even after a property has been sold.)

(a) Medtek estimates the cost of cleaning up toxic waste damage at one of its unimproved storage sites at $1,000,000,
(b) An “unsuspecting buyer” has offered to buy this site “as is” for $800,000,
(c) The cost to “clean up” this site is expected to increase from $1,000,000 to $1,400,000 over the next two years,
(d) Should Medtek elect not to clean up this site today, additional consequential environmental damage from toxic waste leakage and ground water contamination is 20% likely and would cost Medtek an additional $3,000,000 if it waits two years to do the cleanup.
(e) Medtek estimates the site’s market value will increase to $2,000,000 over the next five years,
(f) Medtek’s weighted average cost of capital is presently 15%.

If we calculate the impact upon shareholder wealth associated with three of Medtek’s more obvious alternatives, without regard to differences in risk associated with estimating each of the above cash flows, we would find that:
Alternative 1: Medtek sells this site today to an “unsuspecting buyer” for $800,000 and exposes itself to the 20% probability of $3,000,000 additional consequential environmental damage in addition to the $1,400,000 cleanup cost in two years. This alternative’s impact upon shareholder wealth would be $-712,287. [This was calculated as $NPV = \frac{800,000 \times (1 + .15)^2}{(1 + .15)^2} = -712,287$.]

Alternative 2: Medtek sells this site today after cleaning it up in order to close off future environmental liability at the site and thus reduces the negative impact upon its shareholder wealth to $-200,000 [calculated as $-1,000,000 \times (1 + .15)^2$.]

Alternative 3: Medtek cleans up the site today but continues to hold it for an additional five years before selling it for $2,000,000. Interestingly, the negative impact upon shareholders would be further reduced with this alternative to $-5,646 [calculated as $NPV = -1,000,000 \times (1 + .15)^5$.]

To this point, our analysis implicitly assumes that the risk of incorrectly estimating the (1) future cost of toxic waste cleanup, (2) additional contingent environmental damage liability, (3) proceeds from sale of the property in five years, and (4) average risk Medtek investment opportunities, is all the same. If this is not true, which is usually the case, our analysis above needs to be modified to compensate for these different levels of uncertainty in our estimates of each future cash flow. Regardless of the difficulty in estimating environmentally related cash flows, and the amount of variability in their estimates (i.e., risk), it is important that we attempt to take these risk differentials into account to improve the usefulness of capital budgeting analysis in making environmental decisions to maximize stockholder wealth.

A good case can be made for saying that the degree of uncertainty associated with the estimated market value of the land in five years is a little more risky than Medtek’s usual capital budgeting investment opportunities; but that, the cash flow estimates of future toxic waste cleanup cost and the additional consequential environmental damage cost are very much more risky. Thus, in our capital budgeting illustration above, we might use something close to an 18% “risk-adjusted” weighted average cost of capital to find the “present worth” today of the $2,000,000 estimated sale proceeds in five years. Doing so would reduce the computed $PV$ benefit to Medtek stockholders, derived from investing in this site for five years, by over $120,000.

Two reasons, in addition to those mentioned earlier, that there is so much uncertainty in estimating the cost to clean up toxic waste in the future are the possibility of (1) a company having to comply with more stringent environmental regulations in the future and (2) the very serious problem of more consequential environmental damage occurring when toxic waste cleanup is delayed. If the environmental cost estimates used in the illustration above were positive cash inflows, then a “risk-adjusted” weighted average cost of corporate capital as high as 21% might be appropriate to use. But since all costs are forecasted cash outflows, rather than cash inflows, Medtek’s 15% cost of capital needs to be risk-adjusted downward by 6% to 9% (i.e., 15% - 6% = 9%), rather than upward by 6%, to correctly compensate for these very much less certain future environmental cleanup cost estimates.
By substituting these risk-adjusted discount rates into our previous capital budgeting analysis, we can now calculate a more theoretically correct impact upon shareholder wealth for each of Medtek's alternatives:

**Alternative 1 (Risk-adjusted):** The negative impact upon Medtek's shareholders, if it sells the site today "as is," looks even worse now, with NPV dropping an additional $171,073 to $883,360 [calculated as \( NPV = 800,000 - (3,000,000 \times 20\%) / (1 + .09)^2 - (1,400,000 / (1 + .09)^2) = -883,360 \) compared to the non-risk-adjusted NPV calculated earlier of $712,287].

**Alternative 2:** The impact upon shareholder wealth to clean up the site today and then sell it remains unchanged at $200,000 [calculated earlier as the $1,000,000 cleanup plus $800,000 sale proceeds = $200,000].

**Alternative 3 (Risk-adjusted):** While Medtek's cleanup of the site today and holding it for five more years still benefits shareholders the most, the negative impact upon shareholders has increased greatly now to $125,782 [calculated as \( NPV = -1,000,000 + 2,000,000 / (1 + .18)^5 = -125,782 \)].

Interpretation of the above analysis suggests that Medtek should definitely clean up the toxic waste on the land today before environmental costs go higher, whether or not it plans to hold on to this site for an additional five years. Of the three alternatives, it appears that Alternative 3 still minimizes the cost to shareholders by reducing Medtek's environmental cleanup costs to the smallest negative NPV of $125,782.

While the above decisionmaking approach is theoretically correct, it is nevertheless extremely difficult to apply in practice. Not only are individual cash flows very difficult to accurately forecast, but estimating the risk differences among these cash flows, enabling estimation of the appropriate risk-adjusted weighted average costs of capital, is even more difficult. While Brigham and Gapenski [2] and others suggest a number of analytical procedures in order to do this, probably a variation of the "Accounting Beta Method" would be most appropriate to use in these types of situations.5

An easier approach to estimating risk-adjusted weighted average costs of capital, consistent with current company practices, would be to extend Brigham and Gapenski's [2, p. 414] estimation of risk differential categories for individual long-term investment opportunities to the estimating of risk differential categories for different types of cash flows (e.g., property market values, environmental cleanup costs, consequential environmental damage estimates, etc.). Thus, in order to estimate a risk-adjusted cost of capital for environmental cleanup costs, a company would have earlier established policy that project cash flows in this high risk category should be discounted at the company's weighted average cost of capital (say 15%) plus a risk premium (say 3%) to yield an appropriate risk-adjusted weighted average cost of capital (say 18%). Where required rate of return risk premiums are already implicitly set by secondary markets for publicly traded common stocks (with the aid of beta-coefficients) and bonds (through the yield differentials between rating agency bond grades), the challenge here is that managers must resort to techniques used by appraisers in the absence of widely published market data.

To continue with our illustration above, Medtek had earlier established the guideline that real estate investment opportunities should be considered to be of the same average level of risk as the Company's existing operations; but that within real estate project
analysis, estimates of future proceeds from sale of properties, being in a higher risk category than the annual operating cash flows for a property, should therefore be discounted at Medtek’s 15% weighted average cost of capital plus an additional 3% risk premium, or 18%. Likewise, due to the extreme uncertainty associated with cash flow estimates of environmental cleanup costs, Medtek had earlier established the policy of subtracting twice its usual 3% adjustment to its weighted average cost of capital in order to compensate for very much higher than average risk project cash outflows (i.e., 15% − [2 × 3%] = 9%).

While risk estimation and integration within the capital budgeting decision process is, at best, difficult, there are nevertheless a number of additional analytic tools available to companies to assist in comparing and estimating the relative degree of riskiness, for not only individual cash flow estimates, but also for the assumptions underlying each cash flow estimate. Most popular among these risk assessment techniques are sensitivity analysis and scenario analysis.

We need to be very careful in accepting our assumptions that determine the midpoints of our forecast cash flow distributions. If one does not believe the assumptions underlying this capital budgeting analysis, one should definitely not “believe” the calculated NPVs. For example, does one really agree with Medtek’s assumption that the market value of this contaminated site will most likely increase to $2,000,000 over the next five years? Note that this assumption implies an annual growth rate in the site’s market value over the next five years of more than 20% per year [$800,000 × (1 + .2011)^5 = $2,000,000]. In addition, is it possible that Medtek may have underestimated what it will most likely have to pay to clean up its toxic waste if it waits another two or five years? And finally, do you think that Medtek may have underestimated the most likely additional consequential environmental damage liability?

If management questions any of these assumptions, it should again estimate cash flow costs and benefits until it believes these forecasts are the weighted average of its best guesses for all possible outcomes for each future cash flow estimate. Note, that in the above illustration, if the estimated growth rate in the site’s market value is reduced to less than 16.4% per year, then the above analysis would indicate that Medtek should clean up the storage site, sell it today, and write off $200,000 of shareholder wealth.

Corporate Environmental Policies that Contribute to Shareholder Wealth

Mr. Paul Oreoffice, Chairman of the Board of Dow Chemical, recommended to the IDRC World Congress in May 1990, that companies will need to adopt “proactive” corporate policies on environmental issues in the 1990s to prosper and serve their stockholders. George Pilko outlined a “proactive” environmental corporate strategy as one that not only plans for meeting the environmental laws and regulations of the future, but one that develops an environmental strategy that is then reconciled and incorporated within the overall corporate strategic business plan at the highest levels of management.

Mr. Oreoffice recommended that companies become “proactive” environmentally by establishing employee panels and committees to work with legislatures, regulatory agencies, and other officials at all levels of government (federal, state, and local) to insure that good laws are passed that really do the job of adequately protecting our environment. Not only will this provide the opportunity for companies to contribute
their knowledge on production processes, environmental impacts, and new technologies, but it will also educate corporate employees, the public, legislators, and other public officials on more effective ways to adequately protect the environment. Mr. Oreoffice also recommended that "proactive" companies establish voluntary employee programs and seek additional ways to encourage their employees to become involved within their communities to help address environmental issues. Mr. Oreoffice further indicated that it is important for companies and their employees to work with the public and regulatory bodies in an honest and forthright manner on environmental problems in order to maintain mutual trust.

An interesting additional benefit to companies that adopt "proactive" environmental policies will be greater access to the relevant information needed to more accurately estimate the environmental benefits and costs associated with the type of decisions referred to in this article. Not only can cash flow estimate uncertainty be reduced, but project uncertainty itself can also be reduced through better understanding of the legal processes behind passage of future environmental laws and regulations. All such reductions in risk on environmental investment opportunities lower corporate cost of capital and increase the number of environmental projects that companies will find it profitable to undertake.

Summary

This study reviews capital budgeting techniques applied to making corporate decisions regarding environmental risks and investment opportunities. Policies and procedures for evaluating (1) "cost reducing environmentally beneficial investment opportunities" and (2) "environmental contamination clean-up options" are discussed and illustrated. In addition, reasons for the difficulty in gathering environmentally related information to make adequate cash flow estimates are reviewed along with two alternative capital budgeting procedures that can be used to compensate for higher than average risk cash flow estimates. Finally, a number of "proactive" corporate environmental policies are suggested for increasing shareholder wealth in the 1990s.

Notes

1For a summary of current financial theory applied to managing corporate real property see Manning [5] and Nourse [6, pp. 29-40].
2For a review of the current corporate finance literature see Brigham and Gapenski [2] and Brealey and Myers [1].
3For a very readable discussion of how to use risk-adjusted discount rates, certainty equivalents, and other capital budgeting issues associated with evaluating higher risk projects see Madura and Veit [4, pp. 307-27].
4This estimate of the rate of increase in environmental cleanup costs was provided by George Pilko, Pilko and Associates, Houston, Texas, as primarily the result of (1) passage of increasingly stringent cleanup regulations and (2) the likelihood of additional environmental damage caused by postponing cleanup of the original environmental problem.
5The "Accounting Beta Method" adapts Capital Asset Pricing Model theory (i.e., the linear relationship of nondiversifiable market risk to market required rates of return) to estimating a
company’s risk-adjusted weighted average cost in capital for doing capital budgeting analysis where information on market values of shareholder wealth is not available. “Accounting betas” are calculated using regression on key measures of corporate return (e.g., EBIT/total assets) for projects and cash flows of interest for comparison to the “accounting betas” calculated for comparable business activities where the true beta coefficients are known. Since empirical studies have indicated a high correlation between a company’s “accounting beta” and its true beta coefficient, this proxy for market risk can be used to compute a project’s (or cash flow’s) risk-adjusted discount rate using CAPM theory. The “Accounting Beta Method,” along with other methods of adjusting for cash flow risk differentials in capital budgeting, is discussed more fully by Brigham and Gapenski [2, pp. 390–418].

References


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