Earth Common Journal
Vol. 1, No. 1, September 2011

The Cost of Sustainable Development:

Canadian Physical and Social Environmental Valuation

Kolbie Calverley*
University of Alberta, Canada

ABSTRACT

In 1987 the Brundtland Commission declared that *"sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs*." Historically, environmental conservation has been independent of economic growth, but this definition allows the two ideas to integrate together.

A proposed method of sustainable evaluation is to consider the total capital of an environment, including the human-made capital, natural-asset capital, and critical capital. The sum of these capitals is the total capital, and the total must be carried forward for future generations. The first step is to classify both the physical and social environments of concern. The physical environment can be ranked based on its total useful life while the social environment can be ranked based on its priority to society. The second step is to classify them as either human-made, natural-asset, or critical capital using the chart developed in this paper. If the asset falls within the first two categories, it can be developed at a cost. The cost of this substitution is the cost of sustainable development and should be set aside in a compensation fund for future generations. Environments deemed as critical capital cannot be developed due to the irreparable impact it would have on future generations.

The third and final step is to assess the appropriate costs. A dollar value is assigned to a year of existence for the physical environment, and multiplied over its useful life. The social environment's value can be found by using the excess earnings method to create an intangible asset value. The maximum between these two values is the total cost of developing sustainably. The final cost consideration is an additional compensation for developing a physical environment faster than its useful life would normally have

suggested. This can be done by using the difference between the expected value at the current useful life stage and the rapidly depreciated value of the physical environment. The sum of these costs should be set aside for future generations in a compensation fund so they will be able to meet their own needs as we have met ours.

1.0 Introduction

In 1987 the World Commission gave sustainability an injection of life by defining it in terms that every person could understand. The Brundtland report proposed that *"sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs,"* (World Commission on Environment and Development, 1987). This new definition of sustainable development allowed for two things that were previously thought to be at odds with sustainability. First, that there is opportunity for economic growth in a sustainable environment, so long as that growth does not compromise future generations' abilities to meet their needs. Second, this definition gave a new opportunity for exploitative, resource based industries to be a part of the environmental movement and take part in sustainable development.

Historically, projects have not been developed in accordance with this sustainable platform primarily due to the inability to quantify the costs of sustainable development. The author has attempted to define the operating environments of proposed projects in Canada. Each of those environments was then given an economic value and assigned to a capital asset class.

Each of the asset classes helps to determine the associated costs for proceeding with project development. These costs can then be collected from the developer and submitted to a fund that will allow future generations to compensate for the altered environment and still meet their own needs.

2.0 Background

The concept of sustainability was developed out of a social shift towards environmental conservation. Much of the western world has begun to adapt to this new attitude. As a result, developed nations now have an obligation to lead by example and prevent currently developing nations from making the same mistake of compromising environmental integrity for economic growth, as has been the historical practice. Pearce describes sustainability as the loosening of the ties between economic growth and environmental degradation (Pearce & Warford, 1993).

The error in the association between economic growth and environmental degradation can be traced to an inherent error in the concept of economic growth. Economic importance and financial importance do not necessarily mean the same thing; economic importance is defined by having a significant impact on human welfare (Pearce & Warford, 1993). The environment needs to be considered in this context. If the environment is compromised, humans would suffer direct losses of useful and habitable land, as well as indirect losses from health effects and productivity from the land.

The economic growth of a nation can be greatly inhibited by environmental degradation. This is caused by either direct or indirect effects on human welfare and is especially prevalent in developing nations that do not have the ability to substitute technologies for naturally occurring resources. A rough example is laid out by Pearce based on the GNP of Burkina Faso. Burkina Faso is a nation of 16.7 million people and is a very basic example of the kind of developing nation that could benefit from environmental protection, rather than exploitation due to its already limited number of natural resources (Central Intelligence Agency, 2011).

The analysis looked at the loss of biomass each year due to fuelwood for household energy and vegetation. Figure 0-1 - Burkina Faso Lost Biomass shows the losses reported in each category, where livestock is the potential yield lost due to decreased fodder available and cereal is the lost crop productivity due to vegetation. Each loss is accompanied by its respective market value. This estimate shows that biomass losses could be costing the nation nine percent of its GNP, and almost two percent of that can be attributed to lost crop productivity (Pearce & Warford, 1993).

Region	Fuelwood (*cubic meters*)	Livestock (*UGB*)[a]	Cereal (*tons*)
Sahel	0	175,000	19,000
Plateau Central	900,000	26,000	260,000
Sudano-Guinean	1,200,000	0	27,360
Total	2,100,000	201,000	306,360
Price per unit (CFAFS)[b]	22,258	50,000	50,000
Total losses (billions of CFAFS)	46.7	10.0	15.3

Note: The total cost of damage equaled CFAF 72 billion, or 8.8 percent of GNP.
a. UGB, Unités de Gros Bétail, are a standardized unit for measuring livestock.
b. CFAFs are a currency union of several countries linked to the French franc.
Source: Adapted with corrections from Lallement (1990).

Figure 0-1 - Burkina Faso Lost Biomass (Pearce & Warford, 1993)

It is estimated that in industrialized nations, environmental degradation can cost anywhere between one and five percent, with a cost to the US of approximately 1.2 percent of GNP (Pearce & Warford, 1993). In developing nations the losses associated with environmental degradation are much higher, starting at five percent of GNP and going up from there. In developing nations, these losses represent lost resource flows that will affect future GNP growth, whereas in developed countries, these losses generally do not show up in areas directly connected to the GNP, such as changes to human welfare not directly captured by national accounting methods (Pearce & Warford, 1993). In either case, it is evident that environmental degradation is costing nations, and by association, the people and businesses operating within it, a significant amount of money.

2.1 Current Methods

There are several factors to consider when evaluating a project for development. Generally, valuation is based on a simple cost-benefit analysis whereby the benefits minus the costs discounted over time must be greater than zero for the project to advance. Pearce proposes that "…in order to secure an efficient use of resources, outputs should be priced at their marginal social cost, which comprises the marginal costs of production and the external costs of the pollution or resource degradation caused by producing the good," (Pearce & Warford, 1993). This means taking the basic cost-benefit analysis further, by incorporating the costs of pollution and resource degradation or depletion that occur during production.

2.2 Project Valuation

Sustainable development takes the traditional framework of project valuation and ties in environmental factors. Equation 0-1 shows the traditional cost-benefit analysis after incorporating environmental costs as well.

$$Value\ of\ Project = \frac{\Sigma(B - C \pm E)}{(1-r)^t}$$

Equation 0-1

Where B = Benefits
C = Costs
E = Environmental loss or gain
r = Discount rate
t = time

Any given resource will have a Total Economic Value (TEV) as a sum of its Total Use Value (TUV) from indirect and direct use, as well as a Total Existence Value (TEXV) (Pearce & Warford, 1993). If the Total Economic Value of a resource is equal to the Environmental gain or loss, then it can be substituted into Equation 0-1 .

$$Value\ of\ Project = \frac{\Sigma(B - C - (TUV + TEXV))}{(1-r)^t}$$

Equation 0-2

There is also an option price associated with a resource. The option price is the price that people would put on a resource for the option to preserve it for future use. The Option Value (OV) is then the difference between the option price and the expected consumer surplus that the resource would produce if it was exploited (E(CS)). The expected consumer surplus, if the resource was exploited, is the same as the total use value (TUV) of a resource. By substituting in E(CS) for TUV and adding OV the equation reflects the uncertainty of the resources use (Pearce & Warford, 1993).

$$Value\ of\ Project = \frac{\Sigma(B - C - (E(CS) + OV + TEXV))}{(1 - r)^t}$$

Equation 0-3

The last thing that needs to be accounted for in the project valuation is the cost of any environmental damage. If the project results in a net environmental benefit, such as a sewage treatment plant for discharge, the term then becomes a positive (TEC) (Pearce & Warford, 1993).

$$Value\ of\ Project = \frac{\Sigma(B - C - (E(CS) + OV + TEXV) - TEC)}{(1 - r)^t}$$

Equation 0-4

The total project valuation accounts for uncertainty in the resource's use, the option for preservation and the environmental damage associated with exploitation, as well as the standard financial costs and benefits.

2.3 The Economic Value of the Environment

In order to determine the total project value, a value first needs to be put on the environment and the associated degradation from resource exploitation. A natural environment generally serves three main economic functions. The first is direct use to society, such as recreational activities, landscape appreciation, and photography. The second is to provide inputs to industry such as forestry, oil and gas, and mining. The third economic function of the environment is to support life. This can be done through watersheds, wetlands, ozone, oceans and many other areas, and is arguably the most economically important in terms of human welfare (Pearce & Warford, 1993).

The value of these economic functions can be determined using three different methods. The first is by applying surrogate markets. Using this method means to indirectly associate an environmental impact with a financial one, such as the impact of air pollution on property values, or the impact of health hazards by examining the cost of premiums in the labour market (Pearce & Warford, 1993). The second method is to ask people what value they place on the environment. This is known as the Direct Questioning method and is the basis of the Option Value calculation (Equation 0-3). The final method for evaluating the financial value of the environment is to use physical dose response functions. This method is based on the physical response elicited by an exposure to an environmental problem, such as the effect of air pollution on health. A value is then associated with this response based on the market. In this example, the costs of health care to treat any diseases caused by the air pollution could be the associated value (Pearce & Warford, 1993). Each new project that proposes a change to the surrounding environment should determine which kind of economic environment the project lies within and how to evaluate its resulting values. These values can then, theoretically, be input into the cost benefit analysis discussed in Section 0 to determine whether the project can proceed (Pearce & Warford, 1993). Unfortunately, the real world application means that there are still negative environmental costs that cannot be replaced by the benefits.

3.0 Methodology

The primary idea behind a cost benefit analysis is that the costs and benefits are weighed and if benefits outweigh costs the project can proceed. Cost-benefit analysis proposes that the positive benefits can compensate for the negative results. However, the benefits and costs including environmental, occur independently and one does not actually compensate for the other. This concept is in direct competition with the Brundtland definition of sustainability because there are still environmental costs imposed on future generations (Pearce & Warford, 1993).

3.1 Total Capital

Pearce proposes an intergenerational fund that will compensate future generations for the environmental degradation of today by accounting for all lost or changed capital. Equation 0-1 demonstrates the total capital of a project that must be carried forward for future generations (Pearce & Warford, 1993).

$$K = K_m + K_n + K_{n'}$$

Equation 0-1

Where K_m = Human-made capital

K_n = Natural-Asset capital

$K_{n'}$ = Critical capital

Human-made capital refers to things like roads, machinery and factories, while natural-asset capital refers to things like oil, gas, minerals and ozone. Critical capital is the most important term in this equation as it refers to things that are hard or impossible to substitute with another type of capital, such as rainforests or unique water systems (Pearce & Warford, 1993). Each project must pass on the same amount of capital that it began with in order to create a sustainable operation. This is a much more effective way of valuing a project, by allowing real compensation for affected or lost environmental capital by the project, to maintain future generations' abilities to meet their needs

In order to ensure equal capital is passed on, there needs to be some substitution of capital, most likely, human-made for natural. However, problems arise not from substitution, but from the value of substitution required. Several methods were discussed in Section 0 for valuing the environment, though there are other considerations that need to be made as well. The first consideration is that human-made capital can be repaired or re-made, whereas natural-asset capital cannot be. The mining industry has demonstrated that it can indeed reclaim an area by returning it to its previous useful value, but it cannot put everything back exactly as it was, which is to restore it completely. This alone presents a differential in capital as the land has been modified through human interaction. The reclamation steps diminish the amount of capital required to compensate due to the rehabilitation of the land to its previous useful value. Second, when evaluating the capital of some environment, the uniqueness of the environment should be considered in its evaluation. A unique area of land should be valued higher than an area that has no unique qualities (Pearce & Warford, 1993). Finally, as Equation 0-1 suggests, the environment is a capital asset, and as such, some thought needs to be given as to how to appropriately depreciate its value over time. Pearce proposes that when nations depreciate their human-made capital, they must also account for depreciating environmental assets, such as depletion of ore reserves or forestry stocks (Pearce & Warford, 1993). This presents an opportunity for government to create an environmental protection system based on the rates of depreciation. A depreciation rate can be assigned to environmental assets based on whether or not there is human interference. Compensation for future generations could then be based on the difference in the rates of depreciation of.

3.2 The Cost of Sustainable Development

Section 0 suggests that a sustainable operating environment entails carrying forward the same amount of capital for each generation. In order to accommodate for economic development, some human-made capital may be substituted for natural capital; however, critical capital is irreplaceable. The primary difference between human-made and natural capital is the amount of time required to regenerate the capital. A human-made asset is much more easily replicable than a natural asset that takes significantly more time and money, while critical capital would take almost infinite amounts of money and time to replace. The first step in determining capital to be carried forward, is classifying the capital in its current state.

3.3 Social and Environmental Classification

Industries operating in Canada can operate within approximately eight different physical environments, as well as eight different social environments. Table 0-1 - Social and Environmental Valuation shows the different environments for operation, as well as the associated values assigned that will be explained further in Sections 0 and 0.

Canadian Physical Environments	Useful Life	Social Environments	Personal Ranking Value	Associated Value
Coastal Forest	600	**Aboriginal Lands**	3	700
Oceans & Rivers w/Salmon	1500	**Burial Grounds**	4	500
Lakes & Rivers	750	**Natural Beauty**	8	50
Mountain Forest	500	**Historical Significance**	1	1500
Boreal Forest	350	**Uniqueness**	2	875
Arctic/Tundra	50	**Tourism**	6	200
Plains	200	**Significant Food Supply (fishing, hunting, agriculture)**	5	350
Desert	100	**Commercial Value**	7	100

Table 0-1 - Social and Environmental Valuation

The physical environments from the table were chosen as a broad representation of the majority of environments found within Canada. The social environments were chosen to represent a broad spectrum of social considerations, social and cultural values, and ideas of concern to the Canadian people based on the author's perceived interpretations. These represent not a physical environment, but items, aside from physical assets, that need to be considered and valued when considering project development.

Error! Reference source not found. is a graph of potential scenarios that could arise in Canada based on these sixteen environments, such as "Arctic Tourism", "Coastal Forest with Aboriginal Lands", and "Plains with a Significant Food Supply". The graph was then divided, based on the natural cluster of the scenarios, to represent the different capital that can be carried forward through generations. The bottom left corner is defined as human-made capital, the middle region represents natural-asset capital and the furthest outside region that lies beyond the 1000 boundary is classified as critical capital and cannot be compromised.

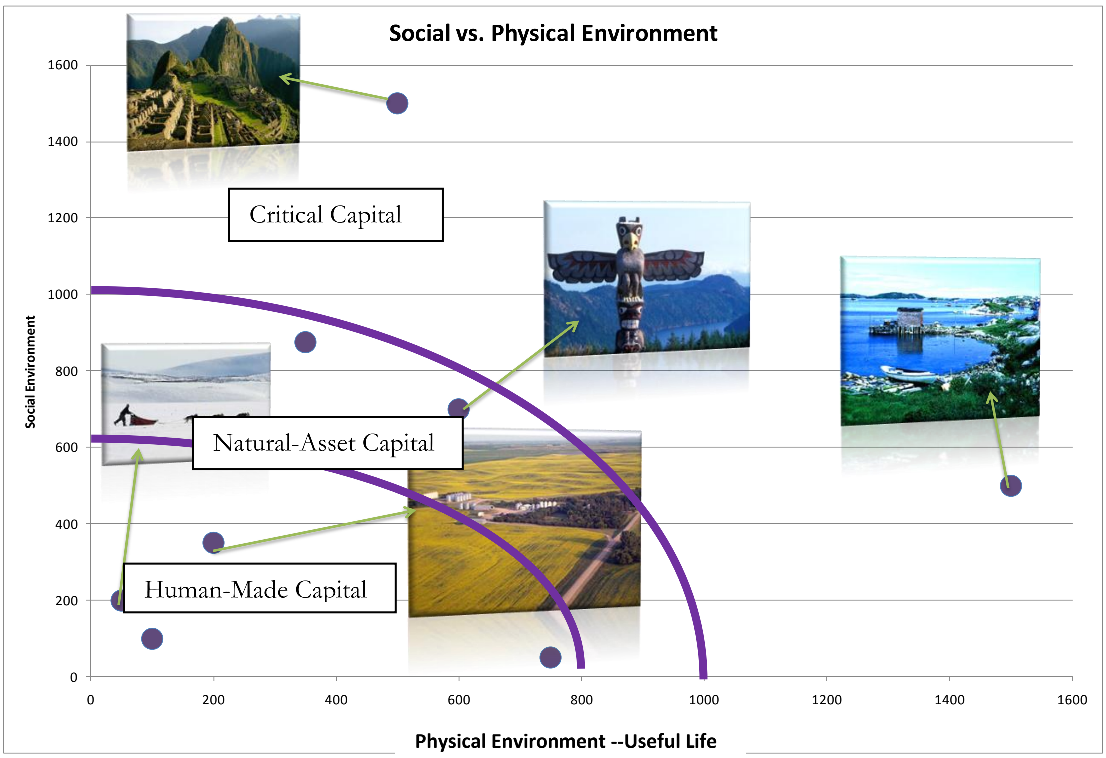

Figure 3-1 – Social and Physical Environment Classification

3.4 Social and Physical Environmental Valuation

Each environment shown above can be assigned an economic value to ascertain the sustainable development costs for any project that alters the existing environment.

3.4.1 Physical Environmental Valuation

The eight physical Canadian environments were assigned an arbitrary useful life. This number was assigned based on personal assumptions by the author, as well as the author's interpretation of the Canadian cultural importance of the environment. At the end of an environment's useful life, its value will be zero and then it can be physically or naturally replenished to re-start its useful life.

The total economic value of the environment can be determined by assigning a dollar value to each year in its useful life, and then summing the total. For the purposes of this paper, a standard value of $1 million per year was assigned to all the physical environments. In future work, each of the physical environments could be assigned a more accurate annual value based on which of the three economic functions the environment serves, as discussed in Section 0.

If the maximum useful life of any environment that can be exploited (that is, any environment that is not considered critical capital) is 1000 years, and there is an associated value of $1 million per year, the total maximum, un-depreciated, value of any physical environment would be $1 billion. It is likely that this value is too low based on the cultural value that society has placed on the environment; however, for the purposes of this paper, this is the assumed maximum.

Table 0-2 - Economic Values of Physical ***Environments*** outlines each of the physical environments and their associated economic values.

Physical Environment	Economic Value ($Million)
Coastal Forest	600
Oceans & Rivers w/Salmon	Infinite (Critical Capital)
Lakes & Rivers	750
Mountain Forest	500
Boreal Forest	350
Arctic/Tundra	50
Plains	200
Desert	100

Table 0-2 - Economic Values of Physical Environments

3.4.2 Social Valuation

Table 0-1 - Social and Environmental Valuation lists a personal ranking and an associated value for each of the eight social environments. These rankings have been assigned on the basis of the author's personal values and perceived Canadian cultural values. The associated economic value was determined by equating the rankings from the social environments to the physical ones, and using the equivalent economic value of the physical environment. This was done to simplify the process and compare the values on the same scale.

Assigning economic values to social environments and functions is considerably more difficult than doing the same for physical environments. There is rarely a distinct economic function, meaning a direct economic input or output, of a social environment. A comparison can be drawn between valuing social environments and a corporate intangible asset (Rasmussen, 2011). Neither has a direct economic function, but rather has some impact on the value of the environment, people or company. There are typically three different valuation methods for intangible assets, which are the market comparison approach, income capitalization and the cost approach (International Valuation Standards Council, 2009). In a social context, the most appropriate valuation method is the excess earnings method, which falls under an income capitalization method. This method was chosen by elimination processes as it does not require a comparison between similar environments like the market comparison approach does, and does not require depreciation and a replacement cost as the cost approach would.

For corporate purposes, the Excess Earnings Valuation method is based on forecasting cash flows for a company into the future, then subtracting all cash flows due to tangible, intangible and financial assets that are not the intangible asset of interest (International Valuation Standards Council, 2009). Using this method in a social environment would mean predicting the cash flows from the total environment, and then subtracting all factors other than the social ones, such as the physical environment and location. The resulting figure is the direct value that the social environment provides.

Due to the constraints of this paper, a simplified process of evaluation was used. Each social environment was ranked based on the predicted outcome of each environment's intangible asset valuation. The rankings range from 1 (most valuable) to 8 (least valuable). After a ranking was assigned to each of the social environments, an associated economic value was given to create an equivalent scale to the physical environment.

Table 0-3 - Social Environments Economic ***Value*** outlines the new rankings based on the economics of the social environments, and their associated dollar values.

Social Environments	Assumed Value Ranking	Associated Economic Value ($million)
Aboriginal Lands	5	500
Burial Grounds	8	125
Natural Beauty	7	250
Historical Significance	4	Infinite (Critical Capital)
Uniqueness	6	375
Tourism	1	1000
Significant Food Supply (fishing, hunting, agriculture)	3	750
Commercial Value	2	875

Table 0-3 - Social Environments Economic Value

3.5 Sustainable Development Costs

The total cost to the developer to maintain sustainability will be the maximum between the physical environment and social costs. **Error! Reference source not found.** is a two-dimensional chart. Each dimension represents the physical or social environments. In order to assess sustainable development costs, a third dimension could be added that would assign a cost to each situation.

3.5.1 Project Evaluation

In the future, during a project's evaluation stage, more emphasis will need to be placed on the value of sustainable development. **Error! Reference source not found.** provides a baseline chart for classifying a project. In order to evaluate the viability of a project being developed sustainably, it must first be assigned a physical environment and then be assigned a social environment. This would likely be done by the governing body that grants the permits and licenses for disturbing the environment. Once a physical and social environment has been assigned, the project can be plotted on the chart and placement will determine whether the project can be developed in a sustainable way. If any project falls within the critical capital region, it should not be developed due to the inability to replicate such capital with human-made capital. If a project falls within the boundaries of natural-asset capital and human-made capital, there should be an associated cost to the developer for proceeding with the project in order to compensate for the change in capital.

The future generation compensation cost to the developer for proceeding with the project would be the maximum of either the social or physical economic values of the environment. A total economic compensation cost example can be given using the example environments created in **Error! Reference source not found.** and combining the values created in

Table 0-2 - Economic Values of Physical ***Environments*** and

Table 0-3 - Social Environments Economic ***Value***.

Table 0-4 - Total Compensation Costs for Example ***Environments*** shows each of the eight plotted environments and the suggested compensation cost to develop. Any environment that contained some form of critical capital as plotted in **Error! Reference source not found.** is considered to have an infinite value and cannot be changed due to the irreparable harm that would be carried forward to future generations.

Environment	Physical Value ($Million)	Social Value ($Million)	Total Compensation Cost ($Million)
Coastal Aboriginal Forest	600	500	1100
Oceanic Burial Grounds	Infinite (Critical Capital)	125	Infinite (Critical Capital)
Lakes & Rivers w/ Natural Beauty	750	250	750
Mountain Forest w/ Historical Significance	500	Infinite (Critical Capital)	Infinite (Critical Capital)
Unique Boreal Forest	350	375	375
Arctic Tourism	50	100	100
Plains w/Significant Food Supply	200	750	750
Desert w/ Commercial Value	100	875	875

Table 0-4 - Total Compensation Costs for Example Environments

3.5.2 Natural Asset Depreciation

As discussed in Section 2.4, a nation depreciates all physical assets, and in order to adequately value an environment, it should also depreciate its natural assets. In the context of this section, natural asset depreciation is referring to the physical environment, not the region in the chart defined as a natural asset.

A natural asset can be depreciated based on its useful life, and the useful life's associated value. Using a straight-line depreciation method, the total value of the physical environment divided by its useful life will give the depreciated amount each year. Based on the assumptions made in this paper, the annual depreciation would be $1 million. When determining the cost of developing a project sustainably, the project should be plotted on **Error! Reference source not found.** using the depreciated remaining useful life of the physical environment.

3.5.3 Costs of Rapid Depreciation

An asset that has a value based on its useful life can theoretically be exploited until the value of the asset is zero. If a project proposes to depreciate a natural asset faster than the natural, or pre-determined useful life depreciation rate, then there should be a compensatory rate applied.

A compensatory scheme could be developed based on the starting useful value left and the starting useful life left, and then applying a premium based on how quickly the project develops. Equation 0-2 - Rapid Depreciation Cost outlines a proposed formula for this premium.

$$Rapid\ Depreciation\ Cost = V_E \times \frac{UL_E}{(10)PL} - RV$$

Equation 0-2 - Rapid Depreciation Cost

Where:

V_E is the value of the physical environment at the end of the proposed project's life without any development

UL_E is the useful life of the physical environment at the end of the proposed project's life without any development

PL is the project's proposed life

RV is the residual value left in the environment at the end of the project's life

An example of this equation applied is outlined below using a boreal forest as the physical environment.

The useful life assigned to a boreal forest is 350 years and the useful value is $350 million. As an example, if a project proposes to begin development in year 100, there are 250 years and $250 million left of value in the forest. The project proposes to operate for 20 years and will reduce the useful life of the forest to 50 years at a value of $50 million. The value that should have been left in the forest would be $230 million. The rapid depreciation cost would be as follows:

$$Rapid\ Depreciation\ Cost = \$230 \times \frac{230}{20 \times 10} - \$50 = \$214.5\ Million$$

The rapid depreciation cost would be a unique and sound way for governments to develop a royalty scheme by putting a real dollar value on their physical environments. Depreciation of the environment is necessary as the value of almost any asset is not infinite.

This cost would be in addition to the sustainable operation cost outlined in the sections above. For a project that lies in a boreal forest with a useful life of 250 years left and a unique social environment, the cost of sustainable development would be the maximum of $250 million for the physical environment (the depreciated value) and $375 million for the unique social environment ($375 million) plus $214.5 million for rapid depreciation costs. The total cost of developing this project in a sustainable way would be $589.5 million, in addition to the standard development costs.

4.0 Conclusion

Sustainable development has been hard to quantify due to the lack of market prices for things like social and physical environments. This paper has attempted to outline eight physical and social environments within Canada, prioritize each of them, and then plot them on a chart that will categorize them into either human-made, natural-asset, or critical capital. Any project that lies within critical capital cannot be developed due to its irreparable harm to future generations' abilities to meet their needs. A project that lies in natural-asset or human-made capital can be developed, given the ability to pay the costs associated with replacing or recreating the existing capital.

The costs of sustainable development can be determined by assigning a cost to both the physical and social environment. A physical environment can, and should have, a useful life and as such, an economic value can be attached to that environment based on its useful life. A social environment can be valued like an intangible asset, primarily using the excess earnings method. The maximum value of between the physical and social environments is the resultant cost of developing a project in a sustainable manner.

The final consideration in development costs is that a physical environment is an asset and should be depreciated over time based on its useful life. If a project proposes to depreciate an environment faster than the natural depreciation, an added cost should be applied to compensate for the shortened useful life of the asset. This premium cost needs further examination, but would provide a strong basis for future royalty schemes for governments to compensate for the exploitation of its natural resources.

**Author: Kolbie Calverley originates from Nanaimo, British Columbia, Canada. She recently graduated from the University of Alberta with an Engineering degree in mining. Three months ago she relocated to Brisbane, Australia with her fiancé to work as a graduate consultant mining engineer. She wrote this paper as part of her final year assignments. As an avid outdoors advocate, she has a personal stake in ensuring that we preserve our environments for future generations to the best of our abilities.*

References

Central Intelligence Agency. (2011, July). *World Fact Book*. Retrieved Sept 27, 2011, from CIA: https://www.cia.gov/library/publications/the-world-factbook/geos/uv.html

International Valuation Standards Council. (2009). *Revised International Valuation Guidance.* London: International Valuation Standards Council.

Mining Association of Canada. (2010). *Towards Sustainable Mining 101: A Primer.* Mining Association of Canada.

Pearce, D. W., & Warford, J. J. (1993). *World Without End: Economics, Environment and Sustainable Development.* Washington: Oxford University Press.

Rasmussen, E. (2011, Mar. 24). (K. Calverley, Interviewer)

World Commission on Environment and Development. (1987). *Report of the World Commission on Environment and Development:Our Common Future.* Retrieved Mar. 13, 2011, from UN Documents: http://www.un-documents.net/wced-ocf.htm