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Exploring the Potential of Environmental Impact Investing for Sustainable Development: The Cases of Dominion Energy and Tesla Motors

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Abstract

Exploring the Potential of Environmental Impact Investing for Sustainable Development:

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The health of our planet and the existence of our species faces an uncertain future. Climate change is the single largest issue facing society today, as carbon-based fuel and combustion engines have driven development in nearly every industry. Public investment through securities markets have enabled corporations to extract coal and oil, build combustion engines, and distribute fuel commercially for over one hundred and fifty years. However, it is now widely accepted that if business-as-usual continues, carbon emissions will cause irreversible and devastating effects to the environment and humankind. International, national, local governments, companies, and general populations have taken steps to combat the existential threat of climate change. Divestment in fossil fuel can come both from market mechanics encouraging investment in alternatives, as well as strategic decisions by corporations to make a change. Offering investors financial vehicles to promote sustainable development will improve the capacity of our world to have a more sustainable future, as well as offer investors competitive returns that are not subject to liabilities expected to continue in the fossil fuel industries. This research describes a quantitative additive preference model based on environmental criteria to analyze both *Dominion Energy* and *Tesla Motors* through the lens of environmental impact investing utility. The purpose of the model is to quantify the potential environmental impact of individual companies to inform institutional and retail investment decisions geared at environmentally conscious investing. Future work should focus on refining the criteria and weights, integrating the model into a fund-management toolkit, and providing greater transparency for all investors to make positive environmentally impactful investment decisions.

ACADEMIC HISTORY

Name (in Full): **Date:**

Christopher J Dibble **May 20th, 2016**

Baccalaureate Degree: Bachelor of Arts in Biology

Source: Clark University **Date: May 20th, 2016**

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<u>Occupation and Academic Connection</u> since date of baccalaureate degree: In October of 2016 I received my series 7 securities license from the Financial Industry Regulatory Authority, and in December of 2016 I passed my Series 66 licensing exam and became a Registered Investment Advisor under the sponsorship of Charles Schwab & Co. Inc,. Since January of 2017, I have worked in a client facing investment advisory role as an Associate Financial Consultant for Charles Schwab & Co. Inc.,. My occupation is connected to my academic research as the following research utilizes a multi-attribute-decision-making model, often used in policy decisions, to inform investment choices for making an environmental impact.

Acknowledgments

This research paper is a culmination of the scientific principles I have had the honor of exploring under the direction of my advisor and professor Dr. Timothy Downs, D. Env. of Clark University in Worcester, MA and the professional experience I have gained from working under the umbrella of Charles Schwab & Co. Inc,. for the past four years. Dr. Downs has been a great influence in my development regarding scientific understanding of contemporary environmental concerns, and fueling my passion for sustainable development, leveraging interdisciplinary approaches and scientific inquiry.

Many countless thanks to my father Sweyden Dibble, MBA, CFP® and Independent Branch Leader at the Charles Schwab Independent Branch in South Windsor, Connecticut. This paper would not be possible without his mentorship and support for my professional and academic education, and for his relentless support as both a father and a boss.

Credit is owed also to my professor Dr. Elisabeth Gilmore, Ph.D. of Clark University in Worcester, MA, who introduced me to comprehensive techniques for creating quantitative multi-attribute-decision models and utility theory which underpins my research.

Finally, I am also incredibly thankful for the support of my mother and my entire family who has always encouraged me and supported me anyway possible in my pursuit of a master's degree in environmental science and policy.

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1.0 Introduction

Today, the health of our planet and the existence of our species faces an uncertain future. Climate change is the single largest developmental issue facing society today, as carbon-based fuel and combustion engines have driven development in nearly every industry. Public investment through securities markets have enabled corporations to extract coal and oil, build combustion engines, and distribute fuel commercially for over one hundred and fifty years. It is widely accepted that climate change is caused by anthropogenic emissions of greenhouse gases, and regulations are being implemented all over the world to transition to a non-carbon emitting state (IPCC,2013). Companies built on oil and coal extraction, and combustion engine production are under scrutiny for the role that their technology plays in climate change. Nonetheless, continued development is reliant on these technologies for building infrastructural capacities, meeting energy demands, and transportation. New technology in energy production, energy storage, and non-carbon emitting forms of transportation are a necessity for global sustainable development. Some firms, such as Blackrock® investment firm, are working to create options for investors to make a positive environmental impact. Significant capital investment will be needed to fund necessary technological transformations, and the Public Securities Market is a promising forum that can be used to fund sustainable development enterprises (Weber and Feltmate, 2016). By creating sustainable development investment options for institutional and retail investors, financial institution may play a pivotal role in altering the course of global development and saving our planet. This research paper describes a framework for selecting securities based on an environmental impact utility score derived

from a quantitative additive preference model based on environmental criteria (Kiker et al., 2005). The model is used to analyze both *Dominion Energy* and *Tesla Motors* through the lens of environmental impact. The purpose of the model is to quantify the environmental impact of individual companies in an effort to inform institutional and retail investment decisions for positive environmentally impactful investing.

2.0 Background

2.1 The link between investment and development

In 1792 the NYSE was founded by 24 stock brokers who signed the Buttonwood Agreement in New York City (NRHP, 1965). Rooted in neoclassical economics, the original stock exchange in the US focused on offering investors government bonds, derivative commodity investments, and equity offerings for US business ventures. The NYSE is now owned by the *Intercontinental Exchange*, a conglomerate that owns 12 exchanges around the world (ICE Website). Historically, over the last couple hundred years human socio-economic development has been accelerated by technology utilizing fossil fuel combustion to provide energy and transportation (Wang and Liu, 2015). Simultaneously national and international capital markets have acted as an engine for industries supported by fossil fuel. However, it is now widely accepted that if business-as-usual continues, carbon emissions will cause irreversible and devastating effects to the environment and human kind (IPCC 2014). International, national, local governments, companies, and general populations have taken steps to combat the existential threat of climate change. One approach for transitioning from a carbon-based economy to a sustainable

state is to transition from the fossil fuel industry. Divestment in fossil fuel can come both from market mechanics encouraging investment in alternatives, as well as strategic decisions by corporations to make a change. Offering investors financial vehicles to promote sustainable development will improve the capacity of our world to have a more sustainable future, as well as offer investors competitive returns that are not subject to liabilities expected to continue in the fossil fuel industries.

Finally, policy guiding institutional investment could play an instrumental role in accelerating the rate of a sustainable technology revolution. Institutional investors are generally held to a higher standard of rules which govern investment restrictions. These restrictions are set by law to protect investors as well as the greater good (OECD, 2016). Many corporations with assets exposed to carbon emission regulations are at a greater risk, and it is reasonable to assume that regulatory restrictions could soon be placed on some institutional investors. In 2010 institutional investors managed 67% of U.S. corporate shares, and controlled over $25.3 trillion, which includes pension funds, mutual funds, hedge funds, banks, insurance funds, and other types of investors managing over $100 million in assets (FINRA Website, 2018). Furthermore, according to the Investment Company Institute (ICI), in 2015 U.S. investment company total assets were $18.2 trillion, which includes mutual funds, exchange traded funds, closed-ended funds, and unit investment trusts. Mutual funds and ETF's custody $17.8 trillion in assets, and are allocated 42% to domestic equity, 14% world equity, 21% bonds, 15% money market, and 8% other (ICI, 2015). These investment vehicles have a tremendous impact on the flow of capital and have potential to shape development by providing capital to companies engaged in sustainable development enterprises.

2.2 The current state of socially conscious investing

Socially conscious investing is a wide spread concept in the modern business landscape and has been adopted in some capacity by nearly all major U.S. financial institutions. Charles Schwab, Fidelity, TIAA-CREFF, UBS, and many others offer investors socially responsible investment options at a retail and institutional level. Socially responsible investing (SRI) seeks to add companies in a portfolio, based on three ESG criteria; Environment, Social, and Governance, incorporates shareholder advocacy, and seeks investment opportunities that have a positive impact on communities. The environmental component looks at the environmental responsibility of a company in terms of pollution, resources consumption and conservation, as well as environmental stewardship. The social aspect includes a company's actions that impact social issues such as wage disparity and gender inclusion. The governance component includes issues of how the company is run, structured, and operates so that they are meeting universal standards of behavior. Hebb et al. (2014) outline the academic literature pertaining to SRI dating back to the 1700s in their paper: "Socially Responsible Investment in the 21st Century: Does it make a difference for Society?" The authors identify four distinct periods of modern SRI literature: 1) divestment and negative screening in the 1970s and 1980s; 2) financial performance of SRIs in the 1990s- early 2000s; 3) mainstreaming SRI in the mid-2000s; and 4) renewed legitimacy of SRI post-financial crisis. Historically, scholarly thought on SRI has seen a change from an ideal-based niche concept to a legitimized process informing real investment in socially responsible enterprises that have a financial benefit as well (Hebb st al, 2014).

In the mid-2000s SRI became mainstream with the uptake of SRI among pension funds (Clark, 2000; Clark &Hebb, 2004: Hawley & Williams, 2000; as cited by Hebb, 2014 page 10), and in the mainstream context, ethical and business cases had been fragmented to cover subsectors of the SRI goal set. The adoption of SRI by Institutional Investors reflects these fiduciaries view of a long-term approach to money management, where sophisticated investors believe that doing good does well. After the 2008 financial crisis literature on SRI experienced a "renewed legitimacy", where instead of basing the case for SRI on traditional short-term financial performance, investment rationales were/are rooted in their contribution to long-term economic stability (Hebb et al., 2014). Furthermore, this phase represents the extension of SRI to sovereign wealth funds, and impact investing into new asset classes.

In 2016, Weber and Feltmate released a book titled "Sustainable Banking: Managing the Social and Environmental Impacts of Financial Institutions", which goes into depth in many dimensions of sustainability as it relates to banking. Notably, the authors call out financial institutions for downplaying and not acknowledging the indirect effects that financing practices have on climate change, and other environmental, social, and governance (ESG) issues in development. This book also reviews how to account for various types of environmental and social risks in lending and project financing, as well as introducing sustainable banking strategies now being adopted by leaders in the financial industry.

2.3 Options for Environmental Impact Investing:

BlackRock® is an example of an industry leader in sustainable impact investing. They offer twelve different investment vehicles in three categories: Climate; Broad ESG; and Impact.

Although considered a leading ESG, BlackRock offers investors only two funds for climate impact investing: iShares MSCI ACWI Low Target ETF (Ticker CRBN) and iShares Global Clean Energy Index ETF (Ticker ICLN). Within the Impact category, BlackRock includes three funds: BlackRock Impact U.S. Equity Fund (Ticker BIRAX); iShares MSCI Global Impact ETF (Ticker MPCT); and BlackRock Impact Bond Fund (Ticker BIIIX). In September of 2016, BlackRock published a report titled "Adapting portfolios to climate change- implications and strategies for all investors". The report outlines fundamental concepts supporting the philosophy of sustainable investing, and outlines criteria for selecting investments that will have a sustainable impact (BlackRock report, 2016).

In response to inadequate investment options specifically for environmental impact investing, the following research outlines a quantitative additive preference model based on environmental criteria to analyze both *Dominion Energy* and *Tesla Motors* through the lens of environmental impact investing leveraging utility theory.

3.0 Methods

A multi-attribute decision-making model was created to compare the hypothetical environmental impact investment score of Dominion Inc. (D) with that of Tesla Inc. (TSLA). A list of criteria for environmental impact were distilled from the previously discussed literature, scaled and ranked, then applied to the analysis of the company's latest 10-K (SEC Website) to derive an overall environmental impact investment score. The objective of the analysis is to maximize the environmental impact of an investment. The model includes 3 different objectives

of environmental importance: climate change; general pollution; as well as water, food, and the environment. These three categories were further broken down into sub objectives. Under the objective of *climate change* was: *energy production* which included renewable energy production and electrical energy storage; *liability* which included emission liability and extraction exposure , referring to business operations resulting in the extraction of fossil fuel from geological repositories; and *asset exposure* which included production facility exposure and electric transportation. General pollution was determined by EPA penalty history. Water, food, and the environment were made up of resource stewardship, including forestation and agricultural practices, and technological contributions, which focused on clean water practices. The 10 attributes were ranked on a scale of 1-5, 1 being the worst for the environment, and 5 being the best. The attribute scales were defined as follows in Table 1.

Table 1

Attribute	Atribute Scale (1-5)	Indicators
Renewable energy production	1.None, 2.Minimal, 3.Suplumentary, 4.Core Focus, 5.Sole purpose	10-K
Elecrical energy storage	1.None, 2.Minimal, 3.Suplumentary, 4.Core Focus, 5.Sole purpose	10-K
Emmision liability	1.Historically liable with no change in attitude, 2.Historically liable with a change in attitude, 3.Indirect Liability, 4.Minimal Liability, 5.No Liability	10-K
Extraction Exposure	1.Coal, 2.Oil and Gas, 3.Rare Earth Metles, 4. Minimal Extraction, 5.None	10-K
Dirty Energy Physical Asset Exposure	1.All of the assets, 2.Majority of the assets, 3.Significant portion of the assets , 4.A small proportion of the assets, 5.Non of the assets	10-K
Electric Vehicles	1.Significantly underminds transition, 2.Underminds transition, 3.Nutral to transition, 4.Supports Transition, 5.Significantly Supports Transition	10-K
Disclosure history	1.More than 10 in 20 years, 2.5-10 in past 20 years, 3.2-4 in past 20 years, 4.1 in past 20 years, 5.None in the past 20 years	10-K
Forestation/ Deforestation	1.Direct Contributor, 2.Indirect contributor, 3.Nuetral Effect, 4.Indirectly benefits reforestation, 5.Directly dbendefit reforestation	10-K
Agricultural Practices	1.None, 2.Direct participant in monocropping, 3.Indirect participant in monocropping, 4.Indirect paricipant of regional agriculture, 5.Direct supporter of regionalized agricultu	10-K
Clean Water Technology	1.None, 2.Minimal, 3.Suplumentary, 4.Core Focus, 5.Sole purpose	10-K

Each company was given a score based on the criteria, operationalized by analyzing individual company's annual reports which are available in the 10k filling with the SEC, and safety regulation information. A swing weighting method was used to assign weights to sub-categorical criteria, and categories were weighted using a direct method. The overall criteria weights are show in Figure 1 below.

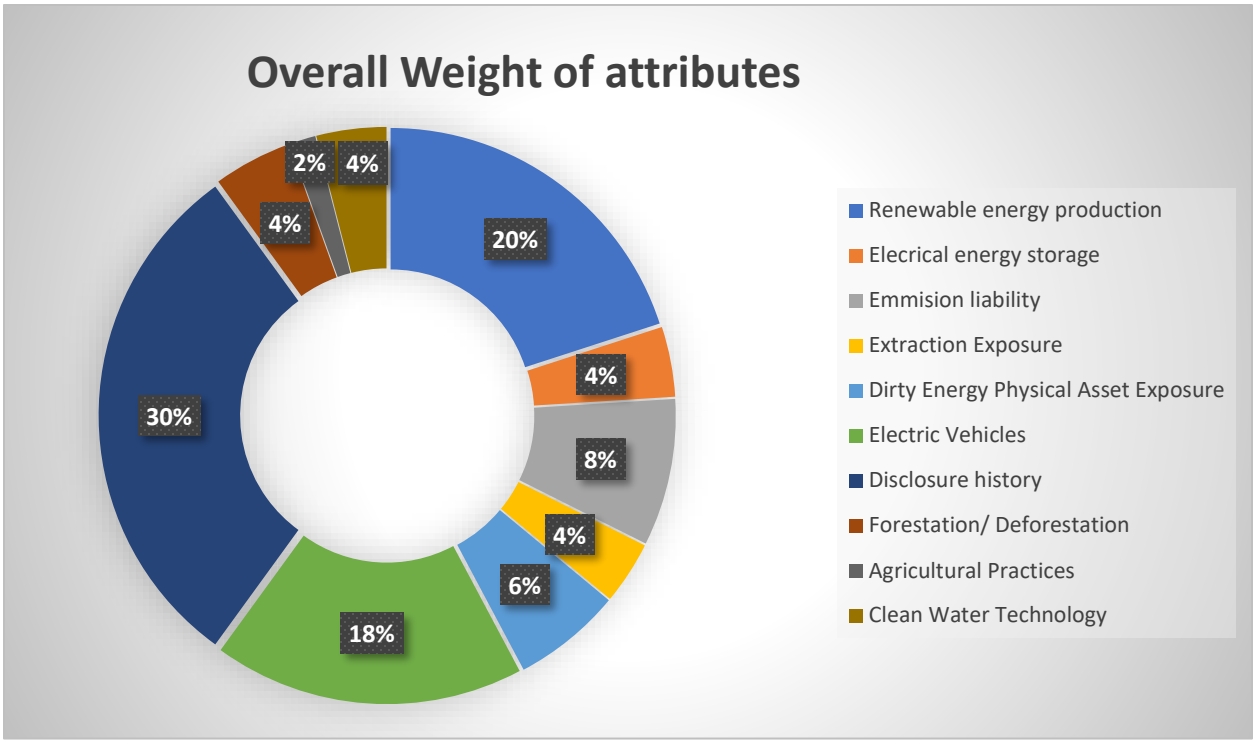

Figure 1: Attribute Weights

The scores were normalized, and weights were applied within an additive preference model (Equation 1) resulting in an overall environmental impact utility score. (Appended Spreadsheet)

Equation 1: $Utility\ score = \sum_{i=1}^{m} k_i\, U_i(x_i)$

3.6 Results and discussion

The result of this research is an additive preference model to measure overall utility for environmental impact investments in individual companies (Figure 2). The model is based on 10 environmental criteria and scores are assigned based on information found in publicly traded companies 10k, or annual report. The adaptive preference model was applied to analyze the environmental impact of two companies Dominion, INC. and Tesla, INC..

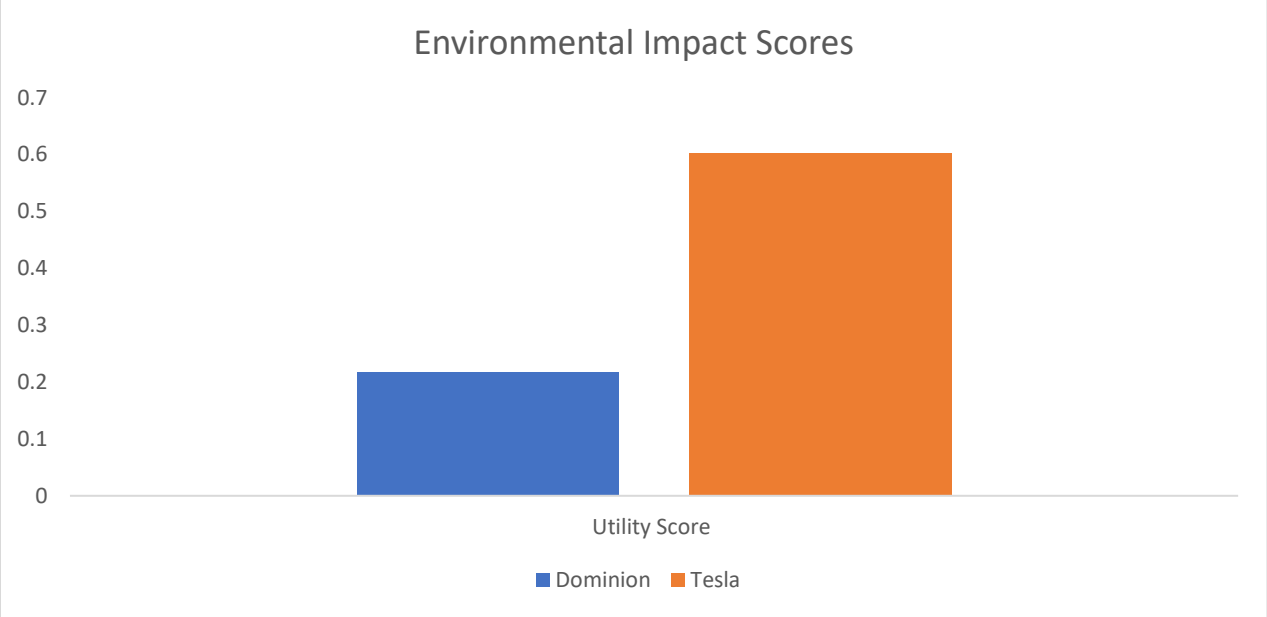

Figure 2: Environmental Impact Utility Score of Dominion Resources, INC.(0.218) and Tesla, INC.(0.602).

The results show a final utility score of 0.218 for Dominion Resources, Inc.(D) and a utility score of 0.602 for Tesla, Inc. (TSLA). These results support the notion that an investment in Tesla Inc. (TSLA) will have a more positive effect on the environment than investing in Dominion Inc. (D). Logically, this makes sense comparing an electric car company with a traditional energy production company in the US. The criteria chosen are not absolute in their scope or measurement and represent just one model for quantifying the environmental investing decision making process. As an example, BlackRock uses seventeen criteria to rank the most environmentally sustainable companies, but they also use special rules to eliminate companies that may not pass as environmentally sustainable. Furthermore, BlackRock goes a step further by including sustainable development bonds that would otherwise not have been found in that screening universe (BlackRock Report, 2016). From a fund management perspective, including sustainable development bonds in a portfolio of sustainable equity shares allows for classic portfolio allocation and investment risk management techniques within the realm of environmental impact investing. Nonetheless, investors are still limited to only a small number of option for investing in mutual funds and ETF's that focus strictly on environmental impacts. At most financial firms, environmental impact investing is grouped in with SRI and ESG motivations that dilute investors environmental return on investment. All said, the model mathematically described in this research (Attached Spreadsheet) offers a tool for investors to quantifiably measure the environmental impact of investing in shares of individual company's equity.

4.1 Weighting:

Selecting how criteria are weighted in the model was a complicated endeavor, and as with any unnatural scale, tends to have subjective components. Future versions of this model may be changed in terms of both the attributes being compared, as well as considering the weighting scenarios in future work. The logic underlying how the model weights were determined was that climate change is the number one environmental issue, pollution is about half as important, and water and food stewardship was a category worthy of inclusion. Nevertheless, the weighting assumption are dynamic, everchanging at different scales, and should be revisited in future work. Within climate change, energy production and asset exposure were considered the most important, and production liability about half as important as each. Including renewable energy production and emission liabilities allowed for the model to capture attributes that contribute to environmental sustainability, while still punishing these companies for the carbon assets that they do own. The second largest attribute within climate change is electric vehicle technology. Globally, 14% of all greenhouse gas emissions come from transportation (IPCC, 2014). Tesla, Inc. (TSLA) is a leader in the revolution to transition from combustion engine vehicles to electric vehicles. As charging stations become more efficient and the range of these vehicles outcompete tradition gasoline powered cars, these vehicles will become more prominent and benefit the investors of companies producing these products (BlackRock, 2017). Although it may be a number of years until all the cars in the US are electric vehicles, a carbon-free future does not include combustion engines. Focusing on the long term is very important, but short-term environmental conflicts should be integrated in a meaningful way (Neaimeh, et al., 2017). The model weights information about the company's

environmental history with the EPA as 30% of the final utility score. EPA information is used to punish companies who have a pattern of environmental misconduct (EPA Archives). Finally, forestry agriculture, water, and food are included as these sectors account for about 24% of greenhouse gas emissions globally (IPCC, 2014). Finally, this model can be adapted by changing the weights of these various attributes.

The purpose of the environmental impact investment additive criteria model is to inform investors about the environmental impact of companies to make the best investment decision to make a positive environmental impact. Mutual fund managers may find this model useful in quantifying the environmental impact of any investment in an absolute and relative manner. Furthermore, an index may be created by applying the model to all securities in the market and tracking a top percentile. Sophisticated investors will often use screening tools to identify opportunities, such as the screening tools available at Schwab.com (Schwab.com Screener). This model could be run against all publicly traded companies, then integrated into stock screening software to give investors an option for investing in companies that make a positive environmental impact. Providing investors with easily accessible information and investment options for environmental impact will improve capital flow to environmentally sustainable development projects. However, it is important to note that, as pointed out by Neaimah et al. (2017), *sustainable development* requires an integrated approach which includes not only investment policies but energy policies, transport policies, land-use policies, economic policies and urban development policies.

5.0 Conclusion:

In conclusion, the US Public Securities Market offers an opportunity for investors to be a driving force of sustainable development. Socially responsible investing has been a concept since long before the NYSE was created but has gained recent interest following the 2008 financial crisis. Investment institutions have recently begun offering investors options for socially responsible investing through funds, holding companies who have a high standard of environment, social, and governance practices. Yet, few institutions offer investors a way of investing for environmental impact in sustainable development. This research outlines an *adaptive preference model* that generates an overall environmental impact utility score for individual companies. This model can be used by fund managers or investment institutions to quantify the environmental impact of all individual companies trading on the NYSE and NASDAQ. Further research should be conducted to parse out the specific attributes and weights of the model. Finally, future work should include analysis of all companies using the model – just as SRI/CSR – socially responsible investing/corporate social responsibility - is now a norm for comparing companies' performance. This will go a long way to encouraging and enabling individuals and institutions interested in positive environmental impact investing.

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Appended Spreadsheet: Multi-Attribute-Additive-Preference Model: Attached on EXCEL SPREDSHEET