



The Greening of Finance: A Brief Overview

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Abstract: This paper provides a brief overview of some of the sustainability developments that companies and non-profit groups have undertaken in the finance area. These include: (1) sustainability in banking, venture capital, and investment companies, and (2) the integration of sustainability as part of corporate social responsibility by large and small companies. Although in practice many corporations have taken on a more social, governance and environmental (ESG) focus, the field of finance generally neglects these areas. Given the dramatic effects that climate change entails for companies, financial theory and pedagogy should expand to encompass sustainability considerations.

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1. Introduction

In a recent article Morales (2013) points out that for the first time in 3 million years, the amount of atmospheric carbon dioxide has exceeded 400 parts per million. He notes that many scientists consider this level to be a watershed event, whereby without changes made in the amount of carbon emissions created by burning fossil fuels, future weather pattern changes will occur, along with lower Arctic ice cover and higher sea levels. In light of climate change, companies will also be subject to greater regulations and environmental risks than before that will affect the way companies do business.

Many large companies are aware of global sustainability challenges, and have joined the Global Reporting Initiative (GRI), Carbon Disclosure Project (CD), and/or the United Nations Principles for Responsible Investment (UNPRI) in efforts for better reporting of and goals to reduce carbon emissions. Large companies have also embraced

sustainability as a key value. In the Accounting Area, major in roads have occurred for sustainability reporting. This includes the establishment of the Sustainability Accounting Standards Board (SASB)). SASB is a non-profit that provides standards for publicly-listed companies in the U.S., with the goal to disclose sustainability issues that are material to the benefit of investors and the public. The SASB standards by design assist companies in their mandatory filings to the Security Exchange Commission (such as Form 10-K and 20-F) that provides information for company performance on environmental, social, and governance issues (www.sasb.org). SASB includes industry working groups in different finance areas (i.e., commercial banks, investment banking and brokerage firms, investment banking, asset management and custody activities, consumer finance, mortgage finance, insurance, and security and commodity exchanges). SASB has the “vision of a world where all forms of capital are accounted for and managed.” This includes environmental, social and governance (ESG) factors, and the recognition that ESG factors have the potential to affect long--term value creation in the public’s interest. With SEC mandates that publicly-traded firms must disclose information how climate change will affect operations, publicly-traded companies have taken seriously climate change and its potential future effects (SASB, 2013)

However, Business Schools have been slow to embrace ESG factors as a key component for both the undergraduate and MBA curriculum. Most efforts in sustainability have been associated with schools joining as a signatory for the UN’s Principles for Responsible Management Education (PRME). Under PRME schools sign on to the mission to “inspire and champion responsible management education, research and thought leadership globally” (www.unprme.org). PRME includes the adoption of six guiding principles to integrate corporate responsibility in a gradual but “systemic manner” into both the education and research roles of universities. As of July 2013, 505 schools worldwide were signatories, sharing information and achievements in curriculum integration and research for incorporating environmental and social responsibility considerations in higher education endeavors. (UNPRME, 2013)

As Matthews (2013, p. 13) points out:

“The greening of capitalism is the biggest change to the world of business since the second industrial revolution, and it is time for business schools to catch up.”

Matthews notes that finance areas in business schools particularly fail to address the challenges of how to overcome inadequate public funding for innovative new technology, particularly for new green energy systems that provide entrepreneurial opportunities. He points out that if solutions to climate change are to be developed, this will depend on innovations in private finance for their development. Business Schools rarely include sustainability as a required part of the curriculum, either as a special topic in required courses or as separate, special courses. Finance as a discipline, in particular, has generally neglected environmental, social, and corporate governance factors as an important part of decision-making. Also, finance theory retains its focus on shareholder

wealth maximization and market efficiency, despite dramatic environmental and social changes that have occurred, as well as changes in public sentiment following the sub-prime loan crisis of 2007 to 2008. A large gap exists that needs to be resolved in finance theory and education to include sustainability as an integrated part of the discipline.

This paper provides a brief overview of some of the efforts that companies have made in terms of sustainable finance (i.e., the *greening of finance*). Section 2 provides an overview of sustainable banking, while section 3 discusses socially responsible investing (SRI) firms, and social investor activism. Section 4 discusses public/private partnerships for financing energy efficiency projects. Section 5 offers a brief overview of other important aspects of sustainable finance, followed by a conclusion.

2. Sustainable Banking

As noted by Jeucken (2002) the Banking Industry has particular sustainability issues in terms of having an enormous paper trail for financial transactions, as well as large energy needs for information systems and back-off operations, and buildings. Stakeholders have also put pressure on banks to curtail lending to companies that is detrimental to the environment or has negative social implications. Banks in their credit analysis and lending activities have been subject to environmental liability issues, so sustainability issues from a lending perspective have been an important risk-management issue. Banks have also realized great cost efficiencies with reductions in energy and paper use, and engaged customers as stakeholders in helping to meet sustainability goals, such as with online banking to reduce paper usage.

Jeucken (2002) points out that as early as 1990 large European and British Banks engaged in energy reduction projects that reduced costs and also were beneficial to the environment. Examples include the reduction of energy costs by \$50 million by National Westminster Bank over 1991 to 1995 and a reduction of 25% in energy costs by UBS over 1990 to 1993, and Tridos Bank, a unique bank that uses solar power and other types of renewable energy for its buildings. Tridos was established in the 1980s in the Netherlands for the purpose of investing in projects that benefitted both people and the environment, and in 2009 won the Financial Times Sustainable Bank of the Year Award.

Bouma, Klinkers, and Jeucken (2002, Chapter 1) point out that potential energy savings of banks are huge, with more banks currently using renewable energy, such as solar energy and reaping substantial cost savings. From a product standpoint, banks have also engaged customers as stakeholders by creating socially and environmentally favorable products, for example credit cards that are biodegradable or that provide paybacks that go to clean energy or other socially desirable projects. Jeucken and Bouma note that external stakeholders that include employees, shareholders, board of directors, as well as customers, governments, competitors, non-governmental organizations, and the public as a whole have been pushing for greater sustainability efforts.

As a sustainability leader in banking, Bank of America adopted in 1991 a set of environmental principles and practices for its vendors and contractors, as well as the bank including greater use of recycling paper and co-founding the Recycled Paper Coalition to provide a larger market and access for recycled paper. Its commitment to sustainability increased with a 10-year, \$20 billion dollar commitment in 2007 to promote sustainability in its lending policies including financing companies engaging in alternative energy technologies and products and services. It also invested in a new energy management system in 2008 for 3,300 banking centers, reducing energy costs and greenhouse gas emissions. Employees and customers are encouraged to be more sustainable with cash incentives to employees for the purchase of hybrid vehicles and loan rate discounts for customers that utilize loans to make their homes more energy-efficient. Special debit/credit cards can also be set up that allow customer purchases to provide funds to developing renewable energy projects. Other large banks, credit unions and regional and community banks have also taken on sustainability initiatives and reaped energy savings. This includes energy savings by renovating buildings to make them more efficient and building LEED-certified building and branches. Examples include JPMorgan Chase, Chittenden Bank, Northwest Georgia Bank, Wells Fargo and many other banks. Banks and credit unions have also set up website that provide ways for customers to be more environmentally conscious (Cooperman, 2011).

As a major change for lending practices, 79 large international banks and one associate in 35 countries as of 2013 have officially signed on to the Equator Principles, encompassing 70 percent of international project debt in emerging markets. Under the Equator Principles, banks agree to guidelines on social and environmental issues in loans to developing countries including making environmental assessments for major loans. The Equator Principles originally set up in 2002 with 10 global banks. Today the Equator Principles includes all project loans of \$10 million or more across different industry sectors, and a credit risk management framework is used for determining, assessing, and managing environmental and social risk for project finance transactions (see www.equator-principles.com and Epstein, 2008). The Equator Principles are applied globally to all industry sections and to four financial products including Project Finance Advisory Services, Project Finance, Project-Related Corporate Loans, and Bridge Loans. Financial Institutions that are Equator Principle members commit to the implementation of the Equator Principles in their internal environmental and social policies, procedures and standards for the financing of projects and are committed to not providing loans to projects with clients that will not or are unable to comply with the Equator Principles (Equator Principles, 2013).

As a platform for engaging interested stakeholders, the Equator Principles have also helped to “spur” the development of other environmentally and socially responsible practices in the finance sector and banking industry including the Carbon Principles in the U.S. (see www.carbonprinciples.org) and the Climate Principles Worldwide (see www.theclimategroup.org). The Carbon Principles provide a methodology for banks and their U.S. power clients to evaluate and address carbon risks in financing electric

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power projects. The Climate Group is a non-profit organization providing leadership for a “low carbon future” including launching a “clean revolution” campaign, including the development of a “massive scale-up of clean technology, green infrastructure, smart design and resource efficiency” to deliver “economic growth and quality jobs” (see www.thecleanrevolution.org).

Large financial institutions have also funded clean energy projects. As noted in Cooperman (2011, p. 123), for instance, Barclays has done multi-million dollar project funding for wind farms, which provided energy for thousands of homes. Wells Fargo provided loans of greater than \$1.7 billion for LEED projects for both construction loans and some permanent financing. Alternative new community-focused banks provide environmentally focused loans that other bank may not finance include New Resource Bank in San Francisco, First Green Bank of Florida, Green Bank in Houston, Common Good Bank in western Massachusetts, e3bank in Philadelphia, and One Earth Bank in Austin, Texas. As pointed out in Hudgins (2008) some challenges remain for Green Building financing in terms of appraisers and underwriters that are unfamiliar with the value created with green buildings including valuing future energy saves and revenues produced over the life of a project.

As Cooperman (2011) notes even small and medium-sized banks have achieved significant savings by being sustainably managed. Alpine Bank, an independent community bank on the Western Slope in Colorado obtained an ISO 14001 certification for its environmental management including its use of clean energy, water conservation, and recycling, and use of recycled paper products and green cleaners. Credit unions have engaged in sustainability efforts as well. Boulder Valley Credit Union (BVCU) in Boulder, Colorado, is a pioneer for eco-friendly credit unions. BVCU started out by purchasing a 10-kilowatt Sun Power solar electric system produces emission-free clean solar electricity. Making this event into a celebration, BVCU rewarded customers for engaging in positive ways to lower their carbon footprint including low-rate financing for home solar electric systems and lower auto loan rates for fuel-efficient cars. BVCU developed strategies to change its employee culture to include recycling, composting, use of recyclable products and conservations of energy and materials across its branches. BVCU also developed partnerships across other businesses, including Eco-Cycle and other environmentally conscious businesses and non-profit environmental groups and an educational website.

Other Credit Unions that have engaged in sustainability include Permaculture Credit Union in New Mexico, Arizona State Credit Union, and Belco Credit Union in Colorado. Efforts have been made by banks to offer incentives for customer online banking and online bill-paying reducing paper waste. Loan discounts for energy saving automobiles, and loans for home solar energy systems, and often have websites with energy savings tips and environmental education for customers. Permaculture Credit Union adopted an ethical code where no loans would be given to businesses that are exploitative and funds are invested in sustainable projects and the community. Arizona State Credit Unions offers loans to community-focused firms engaging in sustainable

project including the financing for Flagstaff's first solar-powered multi-housing development in 2009. Bellco Credit Union developed a partnership with PayITGREEN™ (www.payitgreen.org) to plant trees in the honor of customers as a reward for customers using online banking and e-statements (Cooperman, 2011).

Most large banks publish Sustainability Reports on their websites. Many are part of the Global Reporting Initiative (GRI) and/or the Carbon Disclosure Project (CDP) for reporting on sustainability and carbon emissions. The United Nations Environment Programs (UNEP) publishes a UNEP FI Guide to Banking and Sustainability (see UNEP FI Guide, 2011) that helps banks to understand and implement sustainability in their operations as a sound business practice and an important role in achieving sustainable development. Details on sustainability management are provided including compliance and integration, risk management, environmental management, on-going learning and implementation, monitoring progress against goals, and products and services. Illustrations include current practices of UNEP FI member banks including: (1) Global Banks, (2) Development Banks, (3) Regional Banks; and (4) Local Banks. The UNEP FI Guide emphasizes the importance of public awareness and communication to engage stakeholders and recommends that financial institutions develop and publish sustainability policy statements and periodic reports on how environmental and social considerations are integrated into their operations and practices.

An example for an Environmental Commitment and Sustainability reports is Citicorp's Global Citizenship: A Commitment to the Environment posted on Citicorp's website at <http://www.citigroup.com/citi/environment/>, where its commitment is quoted on page 1 as follows:

“Integrating environmental sustainability into our core business generates value for our clients, customers, communities and our firm. That is why we have a growing portfolio of green buildings, implement a comprehensive set of environmental and social risk policies and play a leading role identifying and financing new environment-based opportunities such as clean energy. Our Environmental Sustainability approach is based on our commitment to our core principles: Common Purpose, Responsible Finance, Ingenuity and Leadership.”

This commitment is followed with Citicorp's strategy to reduce its environmental footprint, manage its environmental and social risks for in transactions, and finance environmental opportunities. Citicorp's sustainability report includes a performance report card including trends and reductions in GHG emissions, LEED projects by building type, and transactions receiving Environmental and Social Risk Management (ESRM) review. Citicorp's Global Citizenship Report 2012 notes achievements in energy emissions reductions by 8.8% and carbon emission by 21.7% from a 2005 baseline year, and directing \$8.02 billion towards its \$50 billion climate initiative, completing a total of \$44.37 billion. It also includes detailed performance measures for its environmental footprint including green house gas emissions and energy use, water and waste from 2005 to 2012 (see Citicorp, 2012).

Many other large banks worldwide are engaging in environmental and social initiatives worldwide. Deutsche Bank in its Corporate Responsibility Report notes a commitment to encourage sustainable community development and to address the changing needs of the underserved. Deutsche Bank set a target in 2008 of maintaining carbon neutrality by the end of 2012 to 2010 on a climate-neutral basis. Deutsche Bank has been improving the company's energy efficiency by reducing energy, water, and paper consumption and utilizing renewable industry, improving waste management, and developing a sustainable supply chain. In 2012 this target was achieved by reducing the bank's global carbon footprint by 20 percent a year after 2008. This achievement put Deutsche Bank as a leader in the Carbon Disclosure Leadership index in 2012, among 33 companies worldwide. In 2012 Deutsche also won a Gold place in the Best Green Intelligent Buildings Awards and the GreenIT Best Practice Awards achieved first place in the Visionary Overall Concept award category (see Deutsche Bank Environmental Report, 2012).

3. Socially Responsible Investment Firms and Social Investor Activism

Socially Responsible Investments (SRI) have become mainstream. With Sustainability Indexes including the Dow Jones Sustainability Indexes (DJSI), the FTSE4Good Index series, the Goldman Sachs GS SUSTAIN ESG (environmental, social and governance) index, the Domini 400 Social Index, MSCI World, the KLD Broad Market Social Index (BMSI) among many others. Many mutual funds offer customers the ability to invest in different types of socially and environmentally responsible indexes as socially responsible investments. SRI investment funds have also grown.

Fung, Law, and Yau, (2010) note major categories of SRI portfolios including environmental, religious or ethical, social and corporate governance, with portfolios often including a combination of these. They also point out different strategies used for constructing SRI vehicles that include focusing on the ESG factors, but also on long-term risks associated with these factors, as well as conventional considerations of risk, return, and time horizon, and five strategies generally used to create SRI portfolios. These strategies include: (1) Investment screens (both positive and negative types of screening), (2) a best-in-class approach, with a comparison and ranking of firms in a specific selected group, such as an industry sector or benchmark index, (3) engagement by working with a company being considered in which a "critical" amount of capital is being invested, as often used for private equity investors and bank lenders; (4) shareholder advocacy and activism to support specific causes; and (5) an integrated approach that may involve a combination of these strategies and /or using investing criteria that includes additional ESG metrics for creating portfolios.

Social Funds (www.socialfunds.com) lists numerous mutual funds that offer social or environmental funds or social index funds including Calvert, Green Century, Domini, Dreyfus, Legg Mason, TIAA-CREF, PIMCO, Pax World, Parnassus, Parnassus, New Covenant, Neuberger, Vanguard, Utopia, among many others. Some SRI funds are more regional, such as First Affirmative Financial Network, LLC, a professional

investment management firm in Colorado that allows individually-tailored portfolios to be created for individual investor customers.

Some SRI mutual funds have been set up as well to be advocates for environmental health issues, as social activists as well using management funds (versus funds being managed) to purchase the minimum share holding requirement to meet SEC proxy resolution filing requirements. Social activists include a mixture of SRI mutual funds, private equity investors, state and city and union pension funds, private foundations, and social-environmental non-profit groups. Non-profit groups such as the As You Sow Foundation and CERES assist in these types of resolutions, and often a group of these types of investors to group together to submit a joint environmental-health shareholder resolution. Many proposals have been successful by engaging companies particularly in cases of harmful chemicals and products to have a proposal withdrawn and negotiated based on future company actions (see Byrd and Cooperman, 2012; 2013; Lee and Lounsbury, 2011).

According to the Forum for Sustainable and Responsible Investment (www.ussif.org/trends and www.tiaa-cref.org/public/pdf/ussiftrends2012pdf) in the 2012 Report on Sustainable and Responsible Investing Trends in the U.S. responsible investments in the U.S. was \$3.74 trillion at the end of 2011, representing a 22% rise from year-end 2009. Assets engaged in sustainable and responsible investing practices are 11.3 percent of about \$33.3 trillion in total assets under management that are tracked by Thomson Reuters Nelson. The use of strategies for investment incorporating environmental, social, and corporate governance (ESG) criteria and shareholder engagement included 443 institutional investors, 272 money managers, and 1,043 community investment institutions with over \$3.3 trillion in assets and another 200 institutional investors or money managers with assets of \$1.54 trillion, that filed or were co-filers of shareholder resolutions on ESG issues.

There was also a 78 percent increase in assets under management over those tracked in 2010, with \$1.01 trillion in assets under management for 720 funds incorporating ESG criteria in their investment strategies (Kropp, 2012). Based on the US SIF Foundation's tracking of the SRI market from 1995 to 2012, the universe of SRI rose by 486 percent. A segment that showed particular growth included private equity and venture capital funds, responsible property funds and hedge funds, as alternative investment vehicles, with 301 vehicles with \$132 billion in assets under management incorporating ESG criteria, a rise of about 250 percent from \$37.8 billion in 2010. Money managers involved in filing shareholder resolutions also increased with 82 resolutions by managers with \$4.9 trillion in assets under management reporting discussion with companies that were in their portfolios, a rise from the 54 resolutions submitted by year-end 2009 (Hinchcliff, 2012; Goossens, 2012; Kropp, 2013).

Specialized and conventional Venture Capital Firms are also heavily involved in ESG investing, particularly in the Cleantech sector. In 2012 Global Clean Technology Venture Investment totaled \$6.46 billion. This was as measured by dollars a 33 percent

decline in total investment, and a 15% decline in deal count recorded as of January 2013 from 829 deals tracked in 2011 to 704 deals, with 60 percent of deals Series B or later rounds. The largest transactions in the top three sectors included biofuels and biochemicals with 53 deals, followed by transportation with 71 deals, and energy efficiency with 140 deals. Top Global VC investors in terms of being the most active Cleantech venture investors including Kleiner Perkins Caufield & Byers, Draper Fisher Jurvetson, Khosla Ventures, Chrysalix Energy Venture Capital, New Enterprises Associates, Braemar Energy Ventures, and Emerald Technology Ventures. As VC investment shrunk, a larger number of corporate investors have stepped in to fill the gap, with \$2.7 billion in corporate partnerships, with some corporations investing in traditional venture capital funds, and others using their own venture companies (Global Clean Technology Venture Investment, 2013; Hull, 2013).

The Green Job Bank provides a partial list of leading Venture Capital Khosla Ventures (a VC firm founded by Vinod Khosla, a co-founder of Sun Microsystems), Kleiner-Perkins Caufield & Byers (a well-known venture capital firm), Draper-Fisher-Jurvetson (a fund backing extraordinary entrepreneurs everywhere that set out to change the world), Vantagepoint Capital Partners (with a strategy to provide cutting-edge technology with the resources to commercialize big opportunities), Foundation Capital (a VC firm that supports new ventures), and Rockport Capital, a leading VC firm that works with cleantech entrepreneurs to “build innovative companies that bring disruptive technologies and products to the 21st century,” among many others (<http://www.thegreenjobbank.com/green-vc/green-venture-capital-firms>). Many of these VC firms need experts in both new types of technology and sustainability as well as financial knowledge.

Private equity firms like KKR have also entered into sustainability in terms of responsible investment efforts. KKR in 2008 established a Green Portfolio program, noting on its website that better environmental performance is “often associated with good business performance.” As noted by Henry R. Kravis, Co-Founder of KKR (green.kkr.com/why-go-green):

“The business case for environmental management has never been stronger. The Green Portfolio Program highlights that nvironmental performance and business performance can go hand-in-hand.”

KKR’s environmental strategy for its portfolio company partners is to build value by increasing efficiency, reducing operating expenses, and boosting the bottom line for portfolio company partners. As a commitment to being a responsible investor, KKR is a signatory to the United Nations Principles for Responsible Investment (UN PRI) and the Private Equity Council’s Guidelines for Responsible Investment, and plans to expand its commitment by joining CSR Europe, a European business network for corporate social responsibility that includes 75 multinational corporations and 27 national partner organizations members (KKR Green Portfolio, 2013).

KKR's environmental strategy includes reducing greenhouse gas emissions which lowers fuel and energy costs; investing in renewable energy which helps manage energy price fluctuations, reducing water use which lowers water costs, reducing the use of raw materials which lowers input costs, reducing solid waste that lowers waste disposal costs, increasing recycling which lowers waste disposal costs and creates new revenue streams, and developing new environmentally friendly products and services which improves supplier and customer relationships (Total enrollments for participating Green Portfolio companies included 24 companies as of December 2012. In 2011, 16 portfolio companies avoided more than one million GHG emissions and 13.2 million cubic meters of water use and saved more than \$644 million as a financial impact (see KKR Green Portfolio, 2013, www.green.kkr.com/why-go-green).

A recent report by UBS Research Focus (2013) is on Sustainable Investing and its competitive investment results, pointing out the importance of incorporating sustainability considerations into investment decisions, noting that while sustainability used to be considered external to the investment process, it is now "increasingly seen as central." Alexander Friedman, the Global Chief Investment Officer for Wealth Management at UBS and Kurt E. Reiman point out a large shift that is demanded with the global economy facing climate change threats, water scarcity, and the depletion of natural resources that are important, along with human-induced factors that are accelerating with population growth. They observe that a growing number of corporations are leading the way and working with nongovernmental organizations and other stakeholders to improve this situation and also gaining sources of competitive advantage. (UBS Research Forum, p. 1). The report shows the history of sustainable investment over time and discusses: (1) the integration of environmental, social, and government (ESG) factors in traditional financial analysis and investment decisions; (2) impact investing where investments are made into companies, organizations, and funds with the intention of generating social and environmental impacts alongside financial return; (3) sustainable theme investing in themes or assets linked to the development of sustainability with thematic funds focusing on specific or multiple ESG issues; (4) engagement and voting engaging companies on ESG matters with a long-term process to have an effect on behavior or increase disclosure, and (5) best in class with a diversified active portfolio strategy choosing the best performing investments within a universe or category or class based on ESG criteria. The report also provides evidence of sustainable investing offering favorable returns over time including trends in the MSCI KLD 400 Social index versus the MSCI US Index from 1990 to the present, and the outperformance of selected "sustainability" funds versus broad equity market indexes, 2010 to 2013 (UBS Research Focus, 2013).

4. Public/Private Partnerships for Financing Alternative Energy Projects

The Global Trends in Renewable Energy Investment report is a United Nations Environment Program backed research study that tracks the finance for green energy across the world from 2004 on. The 2013 report noted a decline of 12% in global the value of investments in renewable energy resulting from a large drop in the cost of solar

photovoltaic technology, as well as weakness in U.S. and EU markets, and an unstable government policy regime for renewable markets in developed economies. China dominated for investment in renewable energy, with its commitments increasing by 22 percent to \$67 billion. However, sharp decreases occurred in emerging economies including South Africa, Morocco, Mexico, Chile and Kenya (see UNEP Report 2013). Macquire (2012) in an interview with experts in the field on who's funding the green energy revolution for CNN, notes that in 2011, 44 percent of all new energy generation capacity added that year was for renewables. More finance was expected when there are lower technological risks.

The U.S. Partnership for Renewable Energy Finance (USPREF) 2012 report on Energy Finance Fundamentals (pages 1 to 3) provides an excellent tutorial on renewable finance sources of project capital and details on the complexity for financing renewable energy projects. The reason why the financing is complex is that the cost over the life of a renewable energy facility is generally higher than that of a conventional generating facility, so government subsidies are often necessary to attract private investors. These are often in the form of tax credits that may be allocated for a project on the basis of its building cost versus the energy produced in the future. Such tax credits may include accelerated depreciation as a tax shelter for owners of renewable energy projects (with renewable energy assets often having a 5-year depreciable life under the Modified Accelerated Cost Recovery System (MACRS) or production or investment tax credits. Thus, potential sources of financing including tax credits, debt financing, such as construction and term loans provided by a bank or bank syndicate based on future expected cash flows for a project, Department of Energy loans, if applicable municipal debt, and project equity that may be supplied by the project's sponsors that may include private equity firms or funds from developers, and structured equity. The report notes that for larger projects, bonds can be issued and sold to institutional investors as a bank loan alternative. Project sponsors have also borrowed against future earnings for a project at a corporate level.

Public/Private partnerships have also helped provide renewal energy for government buildings. Under such a partnership, such as a energy company provides guarantees of future energy savings as a guaranteed for a bank loan that provides funds based on cash flows generated by future energy savings. An example is the upgrading of the Colorado State Capital Building to geothermal energy in July 2013. The upgrading allowed geothermal energy for the air conditioning system and also a replacement of existing pumps and equipment. This upgrade was the second state capital in the nation to do so, and Chevron Energy Solutions performed the upgrade and acted as a private guarantor of future savings for the bank loan. The U.S. Department of Energy (DOE) also provided a \$4.1 million grant towards the overall \$5.5 million project, and the state had just under \$1.5 million to finance for the project's completion. With the public/private funding mechanism, there was zero cost to taxpayers, more than \$8 million in utility savings, and more than 91.2 million pounds of carbon emissions were offset. An important piece of the arrangement included a careful auditing by an accounting firm of future energy

savings to attract bank loan financing, with savings of \$100,000 in heating and cooling costs expected the first year with higher savings for each subsequent year expected to be about 3 percent (Colorado State Capital, 2012; and Casey, 2013).

5. Other Areas of Sustainability Finance

As a growing sub-field of sustainability finance, there are many other different areas including insuring against catastrophe events with climate change, carbon finance and carbon pricing and markets, environmental risk assessment, and financial products, and how to incorporate environmental and social factors including savings and costs and risks in financial decisions, such as capital budgeting techniques.

5.1 Catastrophe Bonds and Derivatives

Another financial area in terms of sustainability is protection against climate change related events. With climate change affecting weather patterns, catastrophe bonds often called “cat bond” and catastrophe derivatives. Insurance companies and even government, such as Haiti, can use catastrophe derivatives to hedge against losses from hurricanes and other catastrophic events. The Insurance Futures Exchange had more than 3,100 contracts traded when it started operations at the end of September 2007 to early January 2008. Catastrophe futures are also traded on the Chicago Mercantile Exchange and NYMEX, with Swiss Reinsurance and Deutsche and ICAP, a large interdealer broker also involved. An advantage of catastrophe derivatives for insurance companies is that reinsurance for large events can be limited, resulting in a serious gap. Energy-traders wanting to hedge the price of a commodity against a hurricane-induced rise can also use these derivatives as a time of insurance (Challis and Gould, 2009). Catastrophe bonds are another way to hedge against climate risk, which are rated, freely traded by qualified investors and a way for investors to enhance the risk/return profile of their portfolios since they are uncorrelated with global financial markets. Indexes on these bonds are also available, such as the Swiss Re Cat Bond Total Return Index (see *Cat Bonds Demystified*, 2012). Pricing of catastrophe bonds and derivatives is a controversial area and worthy of further research in the finance area.

5.2 Carbon Finance, Pricing, and Climate Exchanges

Although the U.S.’s Climate Exchange (CCX) closed at the end of 2010, carbon pricing and the carbon offset market and carbon taxes remain as important discussions for ways to curtail carbon emissions worldwide. The European Climate Exchange (ECX), although prices have fluctuated and fallen with political problems, continues, along with the Chicago Climate Futures Change. The European Environment Agency (EPA) provides data and maps and information datasets on energy and water use (www.eea.europa.edu).

Sonia Labatt and Rodney R. White (2007) provide an excellent overview of carbon finance and the financial implications of climate change as well as a book on

Environmental Finance: A Guide to Environmental Risk Assessment and Financial Products (Labatt and White, 2002). With California passing a carbon-reduction bill requiring a 25 percent reduction in state CO₂ emissions by 2020 and some northeastern U.S. states signing on to a regional agreement for the reduction of CO₂ emissions and greater concern over climate change at the federal level, carbon pricing and finance will remain an important area of finance that practitioners and students of finance should be aware of. Also see Sandor (2012) for a discussion on the establishment of the Chicago Climate Exchange and good derivatives).

5.3 The Role of Finance and Sustainability Efforts

Within corporations the role of finance concerning sustainability is changing. A report by CFO research services with Jones Lang LaSalle (2008) includes a survey of executives that shows incorporating sustainability into the finance function as a work in progress, but that for many companies is considered a high level process. Interviews with finance executives also revealed that finance does play a role in the “environmentally conscious” investment of a company’s assets.

Key findings of the research included:

- (1) a rising importance of sustainable business practices with four of five finance executives surveyed noting that they expected pressure to adopt these practices rising in the next five years;
- (2) a support function for finance through decision support as the most prominent role in a company’s sustainability efforts;
- (3) a lack of decision-making frameworks that take environmental factors into account and an inability to document a link between sustainability initiatives and shareholder value as barriers to increased finance area involvement in sustainability;
- (4) companies are willing to allocate resources to a sustainability initiative even if customary investment hurdles weren’t met; and
- (5) finance executives state they think companies will realize a number of benefits from sustainability efforts, including a rise in brand value and reputation enhancement (Jones Lang LaSalle, 2012).

Kerste, Rosenboom, Sikken, and Weda (2011, p. 9) in their Book on Financing Sustainability also note the role of finance towards accelerating a transition towards a more sustainable economy and society as follows:

“Finance plays a critical role in accelerating the transition towards a more sustainable economy and society. For example, significant additional investments in clean energy infrastructure are needed to meet the growing energy demands and to address the threat of climate change. New financial instruments like green bonds and index-linked carbon bonds may help spur the transition towards a low-carbon economy. Sustainable investment approaches have the potential not only to

stimulate sustainable business practices, but also to generate better risk-adjusted financial returns.”

Some corporations in their sustainability reports note the use of ESG factors in their capital budgeting decisions including adjusting cash flows and discount rates for environmental and regulatory risk factors, although no formal methodology has been derived. There has also been work on corporate greenhouse gas target setting. Autodesk in particular has developed a corporate finance approach to climate-stabilizing targets called C-FACT. The methodology allows for verifiability, flexibility, and fairness based on the Intergovernmental Panel on Climate Change (PCC) report that for climate stabilization to happen green house gas (GHG) emission must fall by 85% by 2050. C-FACT frames this as a call for companies to reduce GHG emissions in proportion to their relative contribution to the economy. With the C-FACT methodology, a company's GHG footprint is divided by the company's contribution to GDP (measured by gross profit divided by world GDP and estimated growth rates through 2050) to derive a Carbon Intensity Reduction Rate. Companies then select a time frame and commit to a public target. The reduction goals are then annualized over a commitment period to reduce the short-term volatility and come up with annual reduction goals, with adjustments made at the end of the year taking into account new GDP numbers, actual financial performance, and a company's actual carbon footprint. Once overall company intensity targets are derived, this can be translated to corporate and division-level absolute targets, whereby each division gets clear orders and can make investments that are based on business cycles (see Autodesk, 2010 a,b).

6. Summary and Conclusion

This paper discusses the need for the inclusion of sustainability into the field of finance and particularly in the academic side in terms of both education for business students and providing research and new theoretical approaches to assist businesses to develop tools to evaluate environmental, social, and governance factors for corporate decision-making. Sustainable finance is becoming more mainstream as a part of risk management and corporate social responsibility for most large Fortune 500 corporations, but in the field of finance, it is not yet part of the finance curriculum and academic research. There is a significant need to incorporate sustainability as a part of the academic curriculum and much research needed to assist companies and practitioners in a new path where companies can profit and make substantial contributions to solving problems associated with environmental, social, and governance challenges with new threats associated with climate change and scarcity of natural resources, and other societal problems.

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