Cover design by Nancy Gelband

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The Discourse Deepens

Angelo A. Calvello, PhD
Editor in Chief

Inspiring change isn't always easy, especially if the goal is global secular change. Yet we should be encouraged by the content of this issue of the *JEI*, encouraged because the discourse on environmental investing is intensifying. Three essays from the United Nations Environment Programme Finance Initiative (UNEP FI) and the commentary by Dr. Matthew Kiernan delineate not only the historical context but also nuanced elements of the discussion. This type of considered thinking leads to decisions, action, and investment.

Mercer, the global investment consulting firm, recently released *Climate Change Scenarios—Implications for Strategic Asset Allocation,* which takes the discussion of environmental investing directly to the asset owners and their investment committees and challenges them to rethink assumptions about asset allocation, risk management, and investment policy. But as our two commentators suggest, while we accept the report as a catalyst, we should remember that it is also a work-in-progress.

The discourse is really just beginning. We need to bring in more voices, voices like Julia Langer's. In Point of View, she shares a process for sparking change: an interactive, Internet-based funding mechanism for environmental investment ideas. Our book reviewers, including Hunter Lovins, a guiding light in cross-disciplinary environmental thinking, introduce serious ideas and have some fun along the way as they add new voices to the conversation.

Some commentators talk about the stagnant nature of environmental investing, especially post-2008 (following the financial crisis and COP 15), but they were never really part of the conversation. Authentic environmental investment ideas are taking shape daily, and transformative investment opportunities are available right now, offering what we in the investment community call real, sustainable alpha. You just have to know how to listen.

Finally, the discourse on environmental investing shifts to Washington, D.C. at the Tipping Point: UNEP FI's Global Roundtable (http://www.unepfi.org/events/2011/roundtable/) in Washington, D.C. on October 19–20, 2011 I encourage all JEI readers to attend the Roundtable, for an intensive, two-day dialogue on environmental investing and sustainable finance.

Thanks for your continued support,

Point of View

ClimateSpark: How Toronto Atmospheric Fund Used Web 2.0 Crowdsourcing and Ideation Methods to Find Innovative Investment Opportunities and Advance Urban Greenhouse Gas Reductions

When you are a small and somewhat picky investor, it can be difficult to find the perfect investee. That is why the Toronto Atmospheric Fund (TAF) is using online dating to meet potential financial partners.

We aren't actually posting our profile on Lavalife. But we are turning to web 2.0 tools and online crowdsourcing to try to find innovative investment opportunities that meet our double bottom line: decent investment returns coupled with quantifiable greenhouse gas (GHG) emissions. By using the web and social media tools, we greatly expand our net for capturing potential new partners; we raise awareness of all that TAF brings to the table from an investment perspective—including sectoral expertise, knowledge networks, and scale-up partners; and we get help from lots of people in identifying, improving, and filtering opportunities.

TAF's preference for investing in more established enterprises rather than high-risk start ups presents a conundrum: how to attract established businesses with relatively small investment dollars (our deals are usually in the $100-$500K range). The answer lies in helping such businesses launch new endeavors or new initiatives.

Property developer Tridel, for example, didn't need TAF's help to finance its condo construction. But it did benefit from TAF's expertise in piloting a new financing approach that led to more energy-efficient construction. TAF understood the problem Tridel faced in wanting to keep unit costs competitive while introducing more advanced energy-efficient construction. The Green Condo Loan addressed this by financing energy-efficiency upgrades while making the condo corporation, rather than Tridel, responsible for actually servicing the loan based on the utility cost-savings unit owners would realize.

Similarly, Glenbarra Energy Systems has lots of experience in installing solar energy systems. But the high capital cost of such systems presented an opportunity for TAF and Glenbarra to work together to develop a "solar utility" approach. Using TAF financing, Glenbarra has now created a subsidiary (GEMCO) that owns and operates solar water heating systems on three (soon to be five) city facilities. The city is guaranteed hot water at the same cost it would be paying if it used natural gas without putting up anything more than roof space.

From these examples, you can see that TAF is a somewhat unconventional financier, at least in terms of deal structure. We're pretty conventional when it comes to expecting our money back with interest! That's what drew us to the "long tail" potential of crowdsourcing new ventures. We knew enterprises that could benefit from our approach were out there, but finding them was a bit like searching for the proverbial needle in the haystack.

Thus was born ClimateSpark, our online business challenge. Launched in the fall of 2010, ClimateSpark offered a relatively modest cash prize ($10,000) for the best business venture that could profitably reduce greenhouse gas emissions. Teaming up with two other cleantech investors—Investeco and Best Funds—we created a potential $15 million capital investment pool, which was key to attracting contestants. And we lined up a bunch of very savvy sectoral experts to weigh in on the proposals.

A chance to raise your public profile; a chance to strut your stuff in front of three serious clean tech investors (as well as contest sponsor TD Bank); and a chance to get feedback from some of the sharpest minds in the climate and clean tech area—those opportunities were enough to attract close to 40 companies to enter the ClimateSpark Business Challenge, which also built an online reviewer community of 800 individuals over five months. Those 800 entrepreneurs, inventors, business people, and students poked and prodded the various proposals for a couple of months, gave them a thumbs up or thumbs down rating or a more detailed review, and posed tough questions. This dynamic interaction identified the nine best proposals to go forward to a second round.

Round 2 gave the contestants one more chance to impress the community with their idea, technology, and business plan before we opened the "Spark Market," where the community members laid the points they had accumulated through their online activity on the line to buy virtual shares in what they thought were the strongest proposals.

The Spark Market was conceived as a "prediction market": Back the right venture and you would be points wealthy as the value of your shares rose. Back the wrong venture and you could be wiped out. (Community members could later use their points to participate in an online auction for everything from an iPad to lunch with world-renowned author Don Tapscott.) The underlying theory of the prediction market is fairly mercenary: the strongest will rise to the top because folks are inclined to back what they see as the strongest proposal, rather than simply their sentimental favorite, in order to increase their wealth.

In the end, we declared three winners. Zerofootprint had the best combined-score and took the $10,000 prize for its Talking Plug device to help homeowners better manage their energy use. Morgan Solar won the Expert's Choice for its groundbreaking concentrated

solar technology. Earthwall, a developer of a "rammed earth" building system that puts a new twist on an ancient building technique, was the people's choice.

There was no shortage of other fascinating ideas: intelligent glass; underwater energy storage; industrial fans that look like whale fins; smart traffic signal controls; and gearless wind turbines; along with some new approaches to established businesses, including renewable energy franchising and turnkey mini power plants for buildings and homes. We brought it all together at the ClimateSpark IGNITE event that celebrated the winners and this new investing approach with a crowd of more than 200 green business types.

ClimateSpark was itself a prototype and we hit our share of bumps along the road. There were the inevitable technical glitches (it took a couple of tries to get the prediction market feature of the website running correctly, uploading videos proved challenging, etc.). It was a challenge to keep the community engaged and contestants responding. And there was a hard-to-resolve tension between contestants not wanting to reveal too much about their new technologies or approaches and the community's need to better understand the potential of their proposed new approach; this goes to the heart of 'open source' innovation or 'ideation' which only works when there is openness and willingness to engage. It takes a lot of hands-on management to keep the momentum building and things running smoothly, even if the contest is virtual.

Live and learn and live some more. We are now deep into planning a second ClimateSpark focused on social ventures—ventures that combine a social purpose with financial sustainability. Of course, as before, one of the social purposes we will be looking for is GHG emissions reduction. We are adding a couple of offline elements to address some of the limitations of the online approach. The online challenge will select 10 ventures, which will then get an opportunity to participate in an in-person business development boot camp, and successful projects will get pitched to a group of grant makers and investors interested in backing these sorts of transformative new approaches.

For TAF, this crowdsourcing approach isn't the only solution to finding good deals, but it is an important new door we can open to stimulate and invite new opportunities. Just as with conventional deal making, it requires lots of elbow grease. The payoff, however, can be on a whole different scale because of the potential to instantly transform your playing field from your local network to the world.

Julia Langer
CEO, Toronto Atmospheric Fund
July 2011

Biography

Julia is a lifelong environmentalist, now focused on addressing climate change from a municipal angle. She is Chief Executive Director of the Toronto Atmospheric Fund (TAF), an arm's length agency of the City created in 1991 to advance solutions to climate change and air pollution (For more information, please go to www.toronto.ca/taf). Previously, during nearly 17 years at World Wildlife Fund (WWF), she led various campaigns including those to address climate change, protect marine turtles, ban toxic pesticides and hormone-disrupting chemicals, and advance organic agriculture. She can be reached at jlanger@tafund.org

Click here to access the Mercer report: *http://www.mercer.com/climatechange*.

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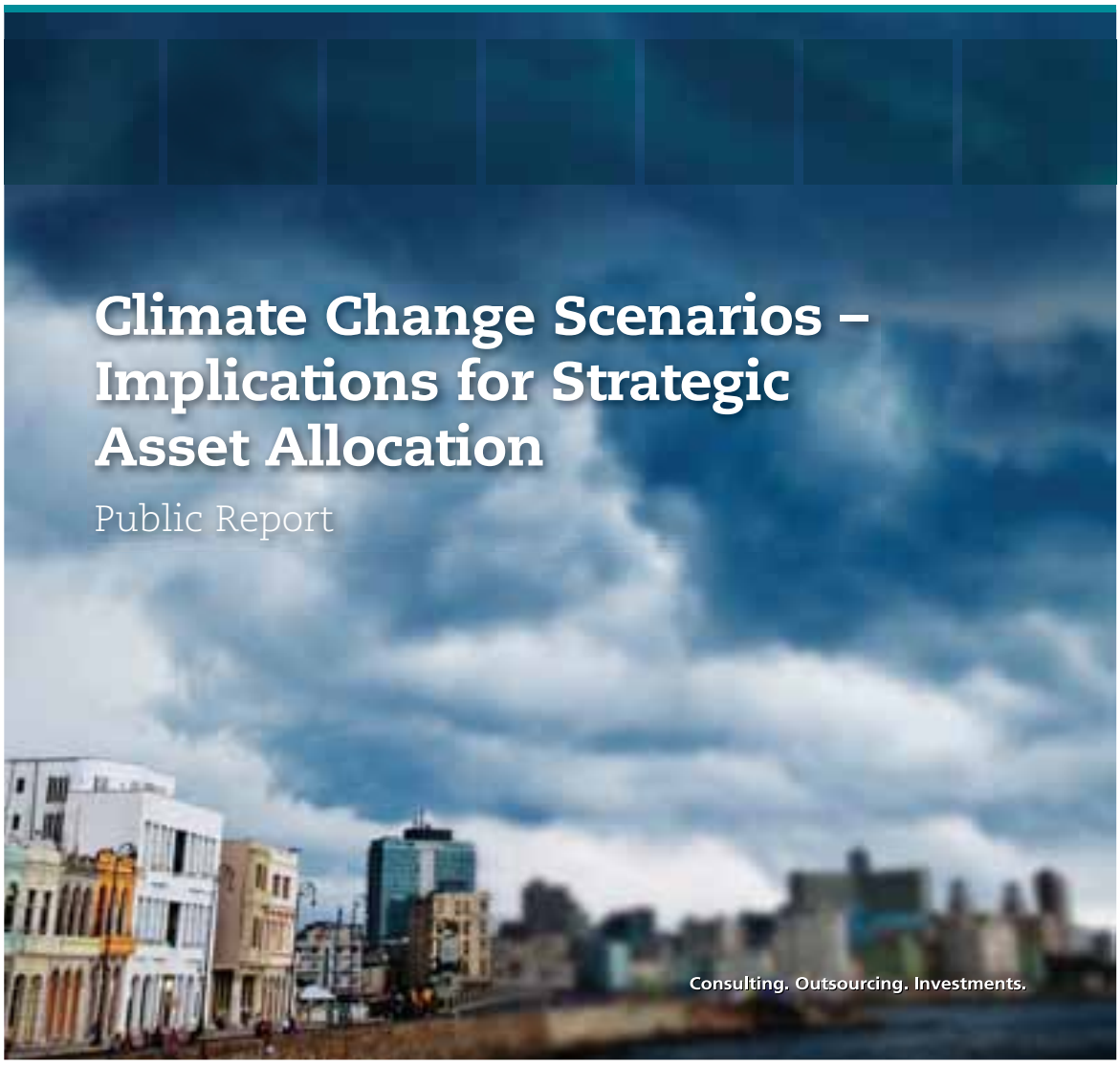

Are Pensions Ready for Climate Aware Investing? A Commentary on *Climate Change Scenarios—Implications for Strategic Asset Allocation*

Keith Black, PhD, CFA, CAIA
Associate Director of Curriculum, CAIA Association

A consortium of authors, representing Mercer, Carbon Trust, International Finance Corporation (IFC), and other institutional investors and researchers recently released a report titled "Climate Change Scenarios – Implications for Strategic Asset Allocation." This report seeks to add climate change as one of the sources of systemic risks facing those tasked with the asset allocation of institutional investors. In addition to the quantitative work of mean-variance optimization for asset allocation, investors are encouraged to implement a qualitative overlay that considers how climate change will impact their portfolio.

While most investors are familiar with the physical effects of climate change, some may be unaware of the impact that climate change can have on their equity and fixed income investments. For example, investing in firms in the utility, materials, and construction sectors that are most vulnerable in a transition to a low carbon world may lead to lower profits for investors once regulatory certainty is achieved and those firms pay higher compliance costs. By choosing to overweight the forward-looking firms whose operations already anticipate how to slow the effects of climate change and comply with potential policies, investors can overcome the potential earnings drag that may result from firms that delay their inevitable investments in environmental compliance.

This lengthy yet informative report is at its best when it presents four possible climate change scenarios and the likely outcome for each asset class under each of the four scenarios.

The scenario most likely to occur is that of regional divergence, a theme that already seems to be well underway. In this first scenario, European and East Asian governments and businesses are the world's most forward looking as they seek to mitigate climate change effects as quickly as possible. Russia is far behind, as its emission levels are high and a policy response has yet to be seen. Most other countries fall between these two extremes. The regional divergence scenario anticipates that Europe and East Asia will attract $2.5 trillion (USD) of the entire world's $3.5 trillion in climate change investments over the next twenty years. Because the policy makers in these regions have (or will have) detailed their agendas, investors in these regions can be more confident in making investments in green projects.

The second most likely scenario is that of delayed action, where world policy makers continue to wait to implement climate change policies. This inaction persists for at least the next ten years, during which time the cost of compliance may have significantly increased. When faced with an issue that is worsening at an unanticipated rate, policy makers may overreact and implement policies with shorter time frames—and therefore higher costs—for industrial compliance.

The most positive outcome described in the report comes under the Stern Action scenario. Policy responses are known in short order, which spurs higher levels of investment due to the less risky investment environment. New technologies are developed quickly, which reduces the impact of climate change in the coming years.

The least likely and most dire scenario presented is that of a climate breakdown. In this projection, as policy makers ignore the issue, climate change continues to worsen for a much longer time period than under the delayed action scenario. In the short term, the costs for compliance are low because there is little regulation in place. However, the long-term costs can be astronomical, as the impact of climate change is increasingly felt before abatement measures are met.

Informative matrices, which detail the impact of each scenario on investment types or by region, are presented throughout the report. For example, sustainable equity and efficiency and renewable investments are portrayed as being positively impacted in the first three scenarios, while agricultural land is positively affected only in the Stern Action scenario. Similarly, the delayed action scenario affects all regions negatively, while Europe and China benefit from regional divergence.

Most investors have heard that strategic asset allocation determines 90% of return variation. Common allocations of institutional portfolios derive over 70% of this risk from equity allocations, with the balance from credit risk and illiquid investments. Under the report's methodology for parsing portfolio risks, 11% of total risks can be attributed to climate change (10% from policy uncertainty and 1% from technology).

The outlook for each asset class is also presented. Investment in climate sensitive assets, including timberland, agricultural land, sustainable equities, efficiency, and renewable assets is encouraged. In order to offset the 11% of portfolio risk stemming from climate policy and technology risk, the asset allocation optimizer suggests up to a 40% weight on climate sensitive investments in a portfolio's strategic asset allocation.

This suggestion seems to go much too far, as few investors are willing to make such a large allocation in an area with continued technological and policy volatility. For example, under the Stern Action scenario, renewables and nuclear energy are expected to

grow rapidly to offset the declining use of fossil fuels without carbon sequestration. The recent issues with the Fukushima nuclear reaction in Japan may possibly move the nuclear agenda into reverse. Investors with an overweight portfolio allocation to nuclear utilities may have suffered from this potential change in climate policy.

In fact, we can make a parallel here between Liability Driven (or, Aware) Investing (LDI) and Climate Aware Investing (CAI). After the passage of the Pension Protection Act (PPA) of 2006, Pyramis Global Advisors estimated that the implementation of LDI strategies by US corporate pension plans doubled in just two years. Of course, the PPA drew an explicit link between the funded status of a pension plan and the corporation's costs and contributions to the plan. There are concerns, however, that in today's low interest rate environment, LDI is sacrificing returns to reduce surplus volatility.

The questions here are (1) whether CAI is as likely to increase in use as LDI was after the passage of the PPA, and (2) whether it is advisable. While CAI is an attractive idea, it will likely have a slower rate of adoption than was recently seen in the response to PPA. LDI had several certainties that are not present in CAI. First, interest rates have a clear link to the present value of the liabilities: as interest rates decline, liabilities increase but the values of fixed income holdings in the asset allocation also rise. That is, the link between interest rates and asset-liability surpluses is well known. Second, the US regulators put in place clear economic consequences for those corporate pensions that do not choose to adopt LDI techniques should their degree of underfunding increase.

In contrast, CAI does not have the same drivers for adoption. First, what is the link between climate change and asset values or asset volatility? The Mercer report suggests a variety of scenarios, each of which has different impacts on each region or asset class. Far from having the certainty of a current regulation behind it, CAI seeks to reduce the asset volatility driven by policy uncertainty, even though policy may move in four different directions that may result in wildly different outcomes and investment implications. CAI suggests large allocations to relatively small and illiquid asset classes, including timberland, agricultural land, sustainable equities, and renewable assets in the form of private equity. With the 2008 crisis still fresh in the minds of pension managers, an increase in the allocation to illiquid asset classes may not be the most attractive option, especially for plans in which the government has chosen to reduce or delay pension contributions. While investments in climate sensitive areas of real estate and private equity can have a meaningful physical impact on climate change in the long run, policy volatility may make specific investments and technologies less profitable and more risky than planned. What is the link between climate aware investing and pension liabilities? The rapid adoption of LDI was based on a clear link between the volatility of assets and

the volatility of liabilities. If climate change were to clearly point to increased or decreased longevity of pensioners, Climate Aware Investing could become quite popular, since certain investments would clearly hedge the liabilities of the pension plan. In the absence of this correlation, though, investors may consider Climate Aware Investing to be just another risk factor in the asset allocation process.

Clearly, this report is informative and a necessary addition to the literature on the challenges that climate change presents to institutional investors. The material presented is valuable, especially where an explicit link is made between climate scenarios and the outlook for different asset classes and regions. However, the report lays out four different scenarios, each having a different impact on each asset class. While CAI can clearly reduce asset volatility when the investor's chosen scenario comes to pass, an incorrect calculation on which policy will be enacted at which date in which geographic region may have the opposite of the intended effect. Rather than reducing asset volatility through Climate Aware Investing, investors may be adopting greater liquidity risk, as well as unwittingly accepting potentially higher asset volatility, if their climate change scenario was not chosen wisely.

Biography

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Climate Change versus Economics: A Commentary on *Climate Change Scenarios—Implications for Strategic Asset Allocation*

Tony Day
Founder and Managing Director of Scarce Capital

The Mercer report, *Climate Change Scenarios—Implications for Strategic Asset Allocation,* represents an important attempt at shifting asset allocation practice away from a world of buy-and-hold passivity toward a culture of scenario contemplation and activist decision making. And it's about time.

It may surprise industry outsiders but boilerplate asset allocation largely operates without much thought for what happens next. The 'S' in Strategic Asset Allocation (SAA) more accurately stands for simple, static, and set-and-forget. Simple: institutional agents (trustees and management) are warned away from consideration of anything below the most basic and broad asset categories (leave it to the alpha experts). Static: asset allocation should be performed in a vacuum of equilibrium economics, divorced from the reality of the dynamic and evolving world in which we invest. Set-and-forget: once you've decided on the basic asset allocation don't touch it—no matter how the future unfolds (at this point, you can't be trusted to behave in any way other than irrationally).

The end result is that most institutional investors are unprepared when their environment evolves and especially when bad stuff happens in financial markets. They will surely have a plan in place if their building catches fire, but, if markets break down (or up), there's no plan to follow and certainly no fire drill to fall back on. Either keep your hands off the wheel or panic.

So kudos to a major global consulting house for admitting that traditional allocation practices are deficient in a world of "deep uncertainty" (which is how the report characterizes the issue of climate change), and bravo for advocating a scenario-based process for thinking about and acting on future unfolding events. Of course, now that Mercer has invented this framework and created a straw man, we have a template for discourse and disagreement.

The Scenarios

The four scenarios presented could have been broader and could have covered a wider range of possibilities, including arguments from a more right-wing perspective. The scenarios tend toward an advocacy of the Stern report and this creates an unduly simplistic

linearization of the problem: a lack of regulation will surely lead to disaster, a bit of regulation means less of a disaster, and (of course) everything will turn out fine if we have lots of regulation.

Never contemplated in the report is the possibility that damaging climate change doesn't occur; for example, climate science ends up being wrong (climate scientists tend to quote this chance at 10%), climate changes are benign, or the world finds a cheap and easy fix. The most commonly ignored dynamic in forecasting climate change is peak oil: we may well be running out of fossil fuels to burn, thus solving climate change. Recent innovations with the potential for achieving dramatic cost reduction in solving climate change are emerging in geoengineering proposals, where terraforming sciences are being applied directly to the problem.

The other missing scenario is that it's already too late, and that climate breakdown will occur regardless of what we do (climate scientists are starting to quote this chance at 10%).

In both of these tail scenarios, the relationship between regulation and economic outcome is reversed: the economic cost of carbon emission reductions will now be of no benefit to the future, and it will be detrimental to portfolios skewed in the ways recommended in the paper.

Likely also to stick in the craw of the Right is the degree to which governmental committees are assumed to get it right. From the Stern Action scenario description:

> *There will be swift agreement to a global framework and a very high level of coordination in policy efforts internationally, resulting in a high degree of economic transformation across the global economy. . . . Less uncertainty for investors about climate policy and new technology investments will be the major drivers of positive transformation.*

The current situation in Europe, with the inevitable breakdown of the Euro-zone despite 20 years of political engineering, is the counterfactual. Historically, transnational committees, even with the best of intentions, have rarely worked. Along the way, policy and technology subsidy choices will invariably be wrong, as new evidence comes in and as politicking trumps common good. What also sticks in the craw of the Left is the reality that nations and peoples have diverging interests and often require competition to resolve differences (with national violence the obvious alternative). What happens when winners and losers are created at the nation-state level due to supra-national coordination decisions? A prime example is monetary policy for the Euro-zone: central bank policy

cannot be set to satisfy both Germany and Greece at the same time. As we are now seeing in Greece, threats to sovereignty are often necessary to assert coordination decisions. Without a European demos (common language, history, and culture) to enable politics, the only long-term solutions possible in my opinion are for Greece to lose sovereignty or to withdraw from supra-national coordination so that it can again be competitive as a nation (by depreciating a national currency, for example).

From an economic point-of-view, the regional divergence scenario may be a better option than depicted in the report. Countries (as well as entrepreneurs, companies, and regulatory bodies) competing to find technological solutions to reduce emissions, experimenting with various carbon trading schemes, and dealing with neighboring state transgressions and climate crisis on a bilateral basis may well lead to a better outcome than an idealized new world order.

It's Climate Change Policy, Not Actual Climate Change, That Is Economically Risky

The report compartmentalizes the investment effects of climate change into technologic change, direct impacts of climate change, and policy effects (called the TIP Framework). Via a filter of proprietary risk analysis, it very quickly narrows in on policy as the key investment risk driver. I saw this as the major finding and key insight of the paper. Technological change is an ever-present risk (and opportunity) in investing—climate change is nothing special. The direct effects of climate change are just too far away to make a difference to today's capital allocation decisions. So policy, by a reasonable economic analysis, is the real economic risk that investors need to manage.

A subtext of the climate change debate is that we now control and determine the planetary future, and our primate brains and social structure are probably not ideally evolved for this responsibility. In economics, we even have a suggestive division of the craft into micro-foundations (incentives and decision-making at the individual level—think primate brain) and macroeconomics (think primate social structure). No surprise then that economics (along with human nature) will tend to discount everything more than 20 years away to have zero effect on today's value. Economics may not be ideally suited to analyzing the market failure that is climate change.

I can't prove it in economics terms, but I personally think that climate breakdown would be a bad phenomenon for listed equities rather than a neutral one with low sensitivity. (This is where the specific terminology used in the report is likely to mislead a casual reader. The rating means that it is unlikely the climate will break down over the next twenty years, so listed equities are unlikely to be affected by whatever regulations are

enacted. However, the long-term prospect of climate breakdown suggests that we won't be spending too much time tallying up pieces of paper with dollar signs written on them. At the end of the day, assets are claims on future wealth and, with little prospect for any sort of future, the value of listed equities will be zero.

Invest in Unlisted Alternatives?

"Climate-sensitive assets," a term used throughout the report, could have been better defined. To quote from the report:

> *Climate sensitive assets refer to assets whose underlying risk/return characteristics are sensitive to the different sources of risk, defined in this study as low-carbon technology (T), physical impact risk (I) and climate policy risk (P). . . . We conclude that the assets that are highly sensitive to climate change include real estate, infrastructure, private equity, sustainable equities (listed and unlisted), efficiency/renewables (listed and unlisted) and commodities (including agricultural land and timberland).*

Is a nuclear power plant sitting on the coast in an earthquake zone climate-sensitive? I think it is, yet the definitions in the paper suggest not—the Fukushima plant was owned by a listed equity company (low sensitivity to scenarios), was certainly not a sustainable asset, and thus would not have appeared in the climate-sensitive asset category.

From an investor's point of view, there is also a dilemma over subsidy capture as a valid strategy. Investing based on government proclamation and support implies a wealth transfer to investors (from the public) and a risk transfer away from investors to the public. Such situations (similar to the current broad-risk asset climate in which the U.S. Federal Reserve is directly supporting risk-asset prices) might be profitable in the short-run but also tend to result in bubbles, misallocations of capital, and bad crashes. Governments choosing winners and promising investors certainty seldom leads to sustainable investing (and sustainable growth).

Large sections of the unlisted asset classes are the problem rather than the solution to climate change investment risk. Infrastructure is largely roads, coal terminals, and energy distribution systems: Won't we be driving less, using less energy and not burning coal, to the detriment of existing capital owners? Real estate (the building industry represents 30% of global emissions according to the report) will surely undergo the liquidation costs of regulated obsolescence. Agricultural land (33% of global emissions) and water rights are dangerous investments, given that property rights may be difficult to assert in times of food and water scarcity.

If you invest in unlisted assets, and are worried about climate change, then you need to try for a very narrow, concentrated portfolio. Don't just tilt your portfolio but go 100% sustainable and renewable. Buy local land, water, and trees (at least your neighbors will get to enjoy them when they're nationalized).

Conclusion

Overall, the report is an excellent example of what scenario analysis is capable of. At its best, scenario analysis can better define a problem domain; can highlight proper orders of magnitude; and more generally lead to productive debate. Climate change may well be the greatest market failure the world has ever seen, as the paper remarks, quoting the Stern report—time will tell. For me, the paper drew out the nature of the potential failure. The horizon of climate change effect may be beyond the normal human capacity for prudence. Given that economics is the science of (human) prudence, normal economics may not deal with climate change very well because humans have difficulty being prudent over multiple generations. Emissions control will at times feel (incorrectly) like an economic burden too big to bear over the next generation or so.

Personally, I would back national competition rather than national co-operation to better address climate change. I would also suggest thinking again about the veracity of alternative assets as a hedge or antidote to the investment consequences of climate change. Maybe a more appropriate hedge is to try to avoid the risks surrounding climate change policy by skewing the portfolio towards "climate-insensitive" assets like low-energy services, home entertainment, pharma, and local (physical and virtual) networking and communication services.

These personal opinions didn't exist prior to reading the paper, and full credit to the authors for creating a framework and analysis that allowed their formulation.

Biography

Tony Day is the founder and managing director of Scarce Capital, an independent advisory firm specializing in collaborating with progressive institutional investors seeking to take responsibility for their strategic decisions. Tony was previously Head of Strategy for the Future Fund (Australia's sovereign wealth fund) and Chief Strategist for Queensland Investment Corporation. He can be reached at mailto:tony.day@scarcecapital.com

Leveraging Strengths: An Analysis of the Partners and Partnership of the United Nations Environment Programme's Finance Initiative

Yuki Yasui, Deputy Head, United Nations Environment Programme Finance Initiative

Abstract

Leveraging Strengths: An Analysis of the Partners and Partnership of the United Nations Environment Programme's Finance Initiative

The United Nations Environment Programme's Finance Initiative (UNEP FI) will celebrate its 20th anniversary in 2012. In recognition of that milestone, this article examines the partners and partnership between the United Nations and the financial services sector worldwide, which have worked on the development of sustainable finance. UNEP FI brings together the convening power of the UN and the influence of asset managers within the investment supply chain to mainstream environmental, social, and governance values in investments.

UNEP aims to steer financial institutions into voluntarily identifying, promoting, and realizing sustainable practices at all levels of financial institution operations with the ultimate aim of mainstreaming sustainable finance. On the other hand, financial institutions are motivated by corporate social responsibility and potential business opportunities in sustainable finance and are prepared to partner with UNEP in the hope of gaining efficiencies and effectiveness that are difficult to attain under private initiatives. A case study on the development of the Principles for Responsible Investment is presented to illustrate these points. Going forward, it is anticipated that UNEP FI will play a greater role in sustainable development discussions and implementation, reflecting the growing need for financial expertise in policy and regulatory discussions that will expand the UN-business partnership from a host-guest relationship to a more equal partnership.

Leveraging Strengths: An Analysis of the Partners and Partnership of the United Nations Environment Programme's Finance Initiative

The United Nations Environment Programme's Finance Initiative (UNEP FI) is a public-private partnership (PPP) and, more specifically, a United Nations-business partnership. UNEP FI was launched at the 1992 United Nations Conference on Environment and Development, the so-called "Earth Summit." It is a voluntary initiative in which financial institutions around the world are encouraged to come together under a neutral platform of the UN to identify, promote, and adopt best environmental and sustainability practice at all levels of financial institution operations. For this purpose, UNEP FI pursues joint learning and research to develop norms, capacity, and standards on sustainable finance and responsible investment. It also coordinates members to participate in intergovernmental processes to promote the financial services sector as an independent actor in sustainable development policy developments. Another characteristic of UNEP FI is that its members come far and wide from the financial services sector. As of 31 May 2011, UNEP FI has 198 members from 46 countries. Members include state-owned development banks, universal banks, institutional investors, asset managers, non-life insurance companies, reinsurance companies, and so on. To manage this diverse membership, UNEP FI is structured along industry lines of banking, investment, and insurance and along regional lines of Africa, Asia Pacific, Europe, North America, and Latin America.

In recognition of UNEP FI's upcoming 20th anniversary, this article offers a critical appraisal of the partnership between the United Nations and the financial services sector worldwide. First the article reviews the motivations of UNEP and financial institutions separately. It then examines how the partnership enjoys added benefits unique to collective action, benefits that are difficult to attain through private initiatives. A case study on the development of the Principles for Responsible Investment is presented to illustrate the points made. Finally, the article ends by touching on the recent expansion of the UNEP FI partnership, which presents new possibilities ahead.

UNEP's Drivers for the UNEP FI Partnership

UNEP's mission is to "provide leadership and encourage partnership in caring for the environment." Hence, a partnership between itself and businesses is a natural extension of its mission. This implementation has been taken up by UNEP's Division of Technology Industry and Economics (DTIE), which UNEP FI is also part of. The division emphasizes voluntary initiatives and partnerships with businesses based on its precautionary approach to environmental management (UNEP 1999). Much of DTIE's mandate to work with businesses originates from the 1992 Rio Earth Summit, which recognized business as offering solutions to sustainable development. Voluntary initiatives are a response to Chapter 30 of Agenda 21, the action plan on sustainable development drawn up by the

UN. The plan grew out of the Earth Summit, which urged United Nations organizations and agencies to engage with business to strengthen their role (UN 1993). Literatures explain that the UN's move for closer cooperation with businesses reflects changes to the governance system and the multilateralism process from the late 1980s with the emergence of global governance (see for example Rosenau 1992; Hewson and Sinclair 1999). Global change such as integration (that is, globalization) and fragmentation of the global political economy has diminished the powers of traditional authority, causing them to rely on the resources and expertise of corporations and civil society and devolving more responsibilities onto them (Hewson and Sinclair 1999).

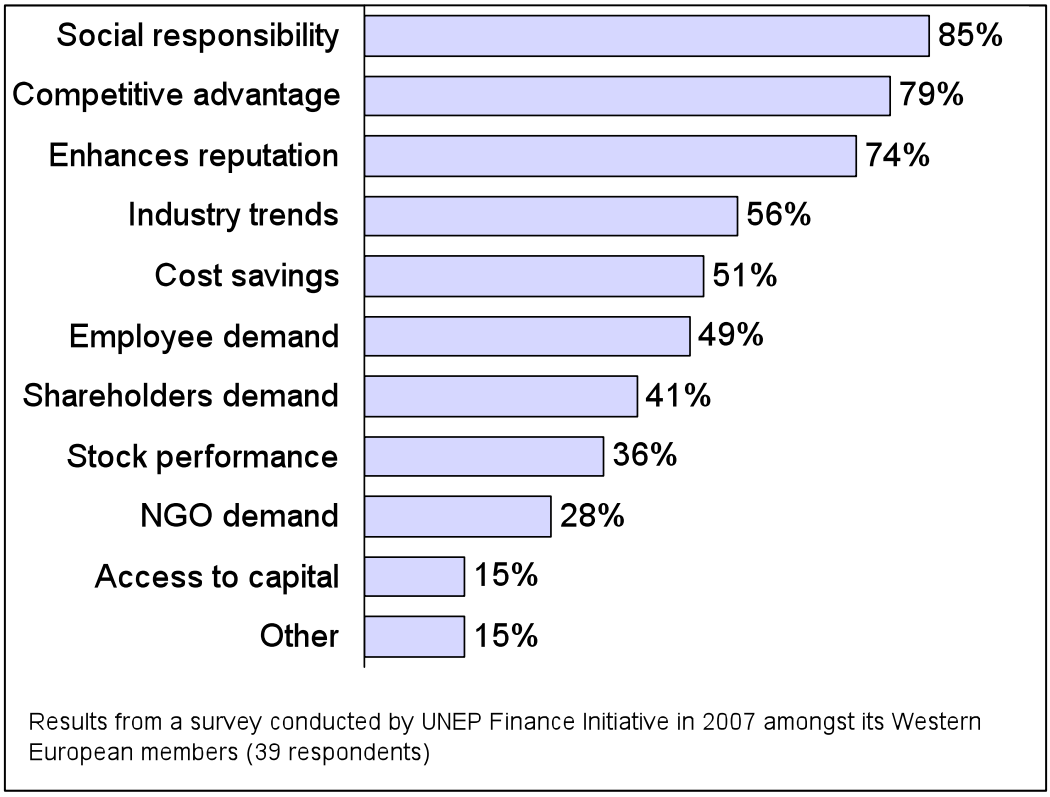
While there are numerous forms of UN-business partnerships (Utting and Zammit 2006), UNEP's traditional position in UNEP FI has been to act as a host to the partnership. UNEP has played a catalytic role in the initiative, which is led in principle by the financial institution members themselves (UNEP 1998). UNEP FI has been directed by a global steering committee consisting of multiple representatives from member institutions, (14 positions today), and only one representative from UNEP. As with the UN Global Compact, the primary objective of UNEP in the UNEP FI partnership is advocacy. It aims to steer financial institutions into voluntarily identifying, promoting, and realizing sustainable practices in all levels of operations with the ultimate aim being the mainstreaming of sustainable finance. At the time that UNEP FI was established, "UNEP was convinced that bankers and investors had a valuable contribution to make in protecting the environment" (UNEP 1998) but did not understand how these contributions could specifically be made. Part of the mandate of UNEP FI was, therefore, to encourage financial institutions to understand and expand their role in establishing a resource-efficient and low-carbon economy. UNEP's function in the partnership has been to gather rival institutions and differing industries within financial services (namely lending, investment, and insurance) to discuss sustainable finance and responsible investing by convening a neutral platform using its UN status and its moral high ground as the protector of the environment.

Financial Institutions' Drivers for Sustainable Finance

To understand the motives behind the participation of financial institutions in the UNEP FI partnership, this section considers the drivers behind adoption of sustainable finance itself. In the first instance, financial institutions are motivated by corporate social responsibility (CSR), which assumes corporations to be accountable to a wider group of stakeholders over and above its shareholders. A survey conducted by UNEP FI in 2007 among its Western European members (39 responding organizations) named *social responsibility* as the most popular reason (87%) for adopting sustainable finance practices (Figure 1). *Enhances reputation*, which is perceived to be an objective of CSR activities,

was also indicated as a strong motive in joining UNEP FI (74%). A majority of UNEP FI members (56%) recognized *industry trends* as the motive for sustainable finance, suggesting the existence of pressures and expectations from peers and stakeholders. Indeed, demands from *employee* (49%), *shareholders* (41%), and *NGOs* (28%) are also listed as motivating factors.

Figure 1: Motives for Sustainable Finance



Source: UNEP Finance Initiative, 2007.

A more subtle relationship between corporate social responsibility and UNEP FI participation may also be inferred from the job titles of the officers the UNEP FI member organizations designate as their main contact people with the UNEP FI secretariat. Of the 198 members today, nearly 73% of UNEP FI's primary contacts hold a CSR function or a related function such as communications and strategy. Many members, especially larger institutions, designate more than one person to work with UNEP FI, in which case they usually nominate the CSR officer as the main contact and the other contacts come from the operational side of the organization. This does not undermine the trend that corporate social responsibility is a strong motivation for financial institutions to participate in UNEP FI.

Another popular motive for financial institutions to consider sustainable finance is the expectation of operational advantages arising from sustainable finance practices. Seventy-nine percent of respondents saw a *competitive advantage* in sustainable finance (Figure 1). First-mover advantage may be gained through actively leading the development of sustainable finance norms and practices via the UNEP FI partnership. Other motives such as *cost savings* (51%), *stock performance* (36%), and *access to capital* (15%) may also be categorized as subgroups to competitive advantage. These upside business opportunities also infer potential business losses from being a laggard in sustainability.

Added Value of Voluntary Initiatives

While a few financial institutions undertake sustainable financial practices alone, it is more popular for them to become involved in one or more voluntary initiatives. Today there is a proliferation of initiatives not only in corporate social responsibility, but also in specialized sustainable finance at the global, regional, and national levels. In general, the sustainable finance and responsible investment networks specialize in specific industry lines (for example, the Association of Development Financing Institutions in Asia and the Pacific and numerous national sustainable investment forums) and along specific themes (for example, the Institutional Investors Group on Climate Change). Among these sustainable finance networks, UNEP FI is in the unique position of being the only UN-business initiative covering all the main functions of financial services: lending, investment, and insurance.

Why do businesses seek to participate in voluntary initiatives? One of the key outcomes of a successful voluntary initiative is that its members, through their collective efforts, are more effective and efficient in their activities than they would be if it were an individual initiative. UNEP FI employs two functions of the partnership in particular that have enhanced its effectiveness and efficiency in developing sustainable finance. First, collective initiatives can accumulate managerial expertise and initiate the global convergence of business practices more effectively and efficiently than individual initiatives (OECD 2001). Another efficiency in voluntary initiatives arises through the application of collective pressure to mobilize internal and external actors. Voluntary initiatives supported by the investment community to put pressure on businesses and industry to report on their carbon emissions—the Carbon Disclosure Project (CDP) and Investor Network on Climate Risk (INCR), for example—have significantly scaled up the number of companies disclosing their carbon emissions. Reporting under CDP has grown more than tenfold since its first request of 235 companies in 2003 to 3,050 companies in 2010 through the backing of 551 investors with assets of USD 71 trillion (CDP 2011). UN-business partnerships like UNEP FI have the added benefit of the UN "brand" in initiating voluntary action.

UNEP FI's member institutions are willing to support UNEP's goal of mainstreaming sustainable finance because it is generally in line with its own motives of corporate social responsibility and competitive advantage. The effectiveness and efficiency of the partnership are most evident in its capacity-building exercises, the dissemination of best practices, and the development of voluntary industry codes. While industry code developments are special projects, capacity building and dissemination of best practices are permanent, year-in-year-out outputs that sit at the core of its activities. In 2010, UNEP FI released thirteen publications, eight of which offered tools and guidance on sustainable finance. In addition, it undertook five regional training workshops on environmental and social risk analysis, five webinars, and five different online courses in 2010. For most of these capacity-building activities, UNEP FI relies on the skills and expertise of its members, which are offered free to the partnership as in-kind contributions. These contributions include responding to surveys, offering case studies and commentaries, editing and reviewing reports, speaking and moderating at UNEP FI events, and representing UNEP FI in other events and in the media.

The resulting UNEP FI outputs, which are the accumulation of members' expertise, are generally made freely available to the public with the aim of encouraging the global development and convergence of sustainable finance practices. While convergence of sustainable finance benefits the industry as a whole, expanding the boundaries of sustainable finance with products and services from the niche to the mainstream offers business opportunities and competitive advantage, particularly to the leaders in the field. Both are potential collective benefits that may be enjoyed by members of UNEP FI and by nonmembers who neither paid their dues nor offered substantive inputs. However, participating members benefit directly from their contributions through the visibility and publicity gained in featuring in UNEP FI activities and the direct association with the UN brand. To some extent, the practical contributions of members also lessen the risk of being criticized for "greenwashing" (Beder 1997) or "bluewashing" (Bruno and Karliner 2000). Both are claims of deceptive public relations practices that aim to give companies a socially responsible image they do not deserve—in the case of the latter, through association with the UN.

Case Study: Development of the Principles for Responsible Investment

UNEP FI is currently developing the Principles for Sustainable Insurance (PSI) to be launched at the United Nations Conference on Sustainable Development (Rio+20) in Rio de Janeiro in 2012, with the aim of establishing a standard for the insurance industry on sustainability practices. Earlier in 2006, supported by the UN Global Compact, UNEP FI led the development of the Principles for Responsible Investment (PRI), which was launched by the then UN Secretary-General Kofi Annan. Five years on, the PRI

has been signed by 900 institutions with combined assets under management of around USD 25 trillion. With the size of the global fund management industry estimated to be just over USD 100 trillion, PRI signatories account for a quarter of the world's investments, and PRI has become the de facto standard for responsible investment. The development of the PRI is documented in this section as a case study to demonstrate how a UN–business partnership has accumulated expertise and mobilized actors to establish a powerful voluntary industry code.

In investing, UNEP FI acts as a global platform for asset managers that collaborate to understand the impacts of environmental, social, and governance (ESG) issues on investment value and to promote best practices in responsible investment. Between 2004 and 2009, UNEP FI undertook two research series that initiated the development of PRI and gave it a theoretical backing. The first is the so-called Materiality Series, which is a series of three UNEP FI reports that look at the effect of the materiality of environmental, social, and governance issues to the valuation of securities. The origins of the PRI can be traced back to a 2004 report titled *The Materiality of Social, Environmental and Corporate Governance Issues to Equity Pricing—Materiality I.* The report concluded that ESG issues affect shareholder value in both the short term and the long term (UNEP FI 2004). The report confirmed previous studies that analyzed a positive link between sustainability performance and financial performance (see for example SustainAbility and UNEP 2001), but it was also groundbreaking in that it established the financial materiality of ESG factors. This report essentially paved the way for a substantive and significant transformation of the socially responsible investment (SRI) landscape. The traditional SRI approach was based on certain values choices, often religious in origin, and therefore was seen as a niche or alternative investment strategy, category, or asset class (Keefe 2008). On the other hand, UNEP FI's work on the financial materiality of ESG issues mainstreamed socially responsible investing in that it opened a new investment discipline or school of thought: it proposes that the best market performance in the long run is achieved only through the full integration of material ESG issues into investment analysis and decision making (Keefe 2008).

This research series takes full advantage of the partnership environment. It is the sort of study that would have been difficult for individual asset managers to undertake on their own in terms of content, scale, and credibility. In terms of its content, it makes business sense for participants that the output would be public knowledge. The research started with the coming together of 12 UNEP FI members from the asset management community to form the UNEP FI Asset Management Working Group (AMWG) in 2003. Their aim was to research the materiality of ESG issues in investment management with the hope that their work would mainstream socially responsible investments. If one asset manager knew from its own research and experience that factoring in environmental, social, and

governance issues had a positive financial impact in the long term, then it would be able to gain from this knowledge in the niche SRI market. However, if this became common knowledge, the asset manager could potentially make substantially larger gains by using individual expertise in a larger market through competitive advantage and first-mover advantage.

In order to establish a new norm, however, the research requires scale and credibility. In terms of scale, for the Materiality I report, the UNEP FI AMWG invited 50 stock brokerage houses to produce industry sector reports on extra financial issues, of which they received back 11 reports. These sector studies, totaling over 1,000 pages, were provided free of charge to UNEP FI. The research probably would not have been financially viable for most partnerships and individual firms if full market price were charged for these reports. But under the UNEP FI partnership, UNEP FI AMWG members leveraged their individual and collective powers as clients to these brokerage houses. The UNEP brand offered credibility and legitimacy that the research was for a public cause and that they would be responding to their social responsibility by cooperating. In the dissemination of its outcomes, the UNEP FI partnership received backing from a fellow UN-business partnership, the UN Global Compact, and the report was launched in 2004 at the UN Global Compact Leaders Summit to maximize the visibility of the report.

Further, UNEP FI was able to boost the credibility of its Materiality Series with legal backing. In 2005 UNEP FI released *A Legal Framework for the Integration of Environmental, Social and Governance Issues into Institutional Investment—The Freshfields Report*. The report, prepared by a leading international law firm Freshfields Bruckhaus Deringer, assured institutional investors that the consideration of ESG issues is firmly grounded within the bounds of fiduciary duty. To date, it is considered the single most effective document for promoting the integration of ESG issues into institutional investment. It has been downloaded more than 320,000 times and continues to be one of the most popular UNEP FI reports today after nearly six years. The Freshfields report was also a *pro bono* work involving 25 lawyers from nine offices around the world.

From the robust conclusions of the Materiality I project and backed by the Freshfields report, UNEP FI started a dialogue with pension funds that became the impetus for the PRI. The success in obtaining the cooperation of the UN Global Compact to have the UN Secretary-General initiate the dialogue was significant, for the UNEP FI partnership had little track record in working with institutional investors. Kofi Annan presented the necessary legitimacy, credibility, and neutrality to this group. But most important was the unprecedented commitment of asset managers, investment analysts, institutional investors, law firms, and other partners. UNEP FI's success was in getting these different

stakeholders to center on a common goal of mainstreaming SRI by highlighting it as a new business model and at the same time aligning it to UNEP's goal of sustainable development. What UNEP FI has learned through the PRI development process is that although the partnership environment is important, as seen below, the single most important determinant of an effective outcome is whether the partnership asks the right questions at the right time. The PRI came at a time when the SRI market was growing rapidly and more research was showing that it was possible to pursue financial performance and ESG performance together. Institutional investors were under pressure to use their influence to correct market failures, but they thought their fiduciary duty stopped them from considering ESG issues. UNEP FI's innovation was to challenge the mainstream investment analysts to look into the financial materiality of ESG issues and to show that the legal interpretation of fiduciary duty has changed.

UNEP FI Going Forward

Although the threat of regulation (preempting or deflecting self-regulation) is often suggested as one of the primary motives for businesses to participate in voluntary initiatives (see for example Maxwell et al. 2000), this has not been the case for sustainable finance partnerships so far. Instead, these partnerships have characteristically encouraged self-regulation in the absence of any foreseen regulation. In fact, UNEP FI and other sustainable finance initiatives often call for new regulation. Sustainable finance businesses are currently niche because they are primarily supported by ethical and CSR values, but they can broaden and become mainstream with regulation that addresses externalities and short-termism in the market. Hence, in 2009 and 2010, ahead of the international climate change negotiations of the United Nations Framework Convention on Climate Change's Conference of the Parties, UNEP FI and other sustainable finance initiatives issued a series of statements (IIGCC et al. 2009; IIGCC et al. 2010a; IIGCC et al. 2010b). These called for more policy and regulatory interventions surrounding climate change mitigation and adaptation, with the ultimate aim of realizing significant growth in the climate change investment market.

UNEP FI predicts that this type of activity will be more popular in the future. For example, at the UNFCCC negotiations in June 2011, UNEP FI brought together industry representatives and international policy makers and successfully incorporated the technical expertise and skills of the private sector into the negotiations. The new change is likely to take the form of what some academic describe as "collaborative governance" (see for example Freeman 1997; Zadek 2006) and "complex multilateralism" (O'Brien et al. 2000), a model that incorporates non-state-based actors such as businesses and civil society into decision-making processes that have traditionally been governed by state authorities and intergovernmental organizations. Increasingly, research undertaken by

UNEP FI and others suggests that the scale of the global environmental problems calls for private-sector solutions. For example, the UK government has estimated that an annual investment of USD17–33 billion is required to reduce deforestation by 2030 for the forestry sector to support efforts in suppressing global temperature rise within internationally agreed targets (Eliasch 2008). To obtain the required scale of investment, state-based actors must work with experts in financial services to establish an effective national and international regulatory framework that encourages the participation of private-sector investors, including financial institutions and intermediaries of different kinds (UNEP FI 2011). Therefore, through UNEP FI, UNEP, and potentially other UN agencies are increasingly encouraged to work with financial institutions in an equal partnership.

Conclusion

The sustainable finance agenda has come a long way over the last 20 years considering that the popular starting point was to explain why financial institutions need to care about the environment. But despite major advances in awareness and expertise on sustainable finance within the financial services sector and in sustainable development within society as a whole, we are in a worse environmental situation than we were two decades ago. Does this mean that sustainable finance is a mere public relations exercise of the finance industry and that partnerships like UNEP FI are ineffective? On the contrary, UNEP FI's experiences, both positive and negative, show that no one actor can solve the complex problems of sustainability and that collaborative efforts need to be scaled up substantially. An effective partnership that asks the right questions at the right time can not only maximize the strengths of the individual partners together, but it can also create significant efficiencies that are attainable only through collaboration. In addition, the growing need for financial institutions to offer their expertise in policy and regulatory discussions will expand the UN–business partnership from a host-guest relationship to a more equal partnership. For these reasons it is predicted that there will be increasing demand for partnerships like UNEP FI to play a greater role in sustainable development discussions and implementation going forward.

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Biography

Yuki Yasui joined the UNEP Finance Initiative in 2002 through the Junior Professional Officer Programme sponsored by the Japanese government. She has set up the UNEP FI online Climate Change Training Course and has worked on the Asia Pacific region. Currently, Yuki is preparing for the Rio+20 event in June 2012 as well as managing UNEP FI as its Deputy Head. She served as a chartered accountant (ACA) with PricewaterhouseCoopers in London and has a BSc honours degree in Economics from the London School of Economics and an MSc in Environmental Change and Management from the University of Oxford. She can be reached at yuki.yasui@unep.org.

UNEP's Finance Initiative: Catalyst for Introspection and Progress: A Commentary on Yuki Yasui's paper: "Leveraging Strengths: An Analysis of the Partners and Partnership of the United Nations Environment Program's Finance Initiative"

Dr. Matthew Kiernan
Chief Executive of Inflection Point Capital Management

UNEP's Finance Initiative: Catalyst for Introspection and Progress

Ms. Yasui's paper provides a useful history and a timely reminder of the considerable progress that the field of sustainable finance has made in the 20 years since the historic Earth Summit in Rio de Janeiro in 1992. Without such a history, it would be too easy to focus on the deficiencies of the current situation and consider the glass to be 70% empty. Ms. Yasui not only helpfully reminds us that the glass is at least 30% full, but also that it has achieved this state in the remarkably short space of 20 years. Global consciousness shifts, after all, do not happen overnight.

As a participant in the aforementioned summit, I have a relatively long history as an observer (and occasional critic) of the world of sustainable finance. As such, I do not believe it would be an exaggeration to say that, before UNEP FI, the field essentially did not exist. Anyone even tangentially involved in it today owes a real intellectual debt to UNEP FI, its staff, and its nearly 200 institutional partners

Perhaps a bit of history will help put the UNEP FI contribution into better context. At the Earth Summit, the principal private sector player was an organization that is now known as the World Business Council for Sustainable Development (WBCSD. Full disclosure: the author of this commentary was a director of said Council). The WBCSD at that time included more than 30 global industrial titans, from the CEOs of DuPont and Mitsubishi to India's legendary Ratan Tata. Despite this august company, the WBCSD did not include a single banker or financier! It was not for lack of trying, either: the Council's multibillionaire chairman, Stefan Schmidheiny, had personally entreated at least three of the chairmen of what were then the world's ten leading banks. (Several of these banks no longer exist, perhaps for reasons that are about to become clear).

In my limited experience, any time a global bank chairman receives a request from a multibillionaire, he (they were all men) is at least inclined to give it a sympathetic hearing. And when that request comes complete with an opportunity to hobnob for 18 months with 30 of the world's leading industrialists (read: prospective banking clients), the banker

becomes positively enraptured. Yet in this case, the WBCSD chairman was turned down flat by all three bank chairmen. How can that possibly be? Well, circa 1990, conventional wisdom in the world of finance held that sustainability issues and challenges were the proper and exclusive province of governments and NGOs, but emphatically not of financiers. The chairman of one of the world's leading banks put the case succinctly: "We don't cut down any trees at the bank; this has nothing to do with us!" 'Nuff said!

In short, when UNEP FI came into existence, 99% of what was intended to be its target audience couldn't even spell the word *sustainability*, much less understand or practice it. UNEP FI was starting from square one. Ms. Yasui argues correctly that the three most important legacies of UNEP FI's work to date are the following:

- Initiating and publishing the Materiality Series, an impressive collection of research and thought pieces that make a convincing case for the competitive and financial relevancy of sustainability or ESG (environmental, social, and governance) issues. Much of the credibility of the reports flows from their authorship by some of the world's leading financial institutions.

- Commissioning and publishing the "Freshfields Report," a groundbreaking piece of legal analysis by one of the world's leading international law firms. The report argued forcefully that a modernized version of the notion of fiduciary responsibility must be sufficiently capacious to embrace sustainability. Prior to the report (and still in many quarters today), sustainability deniers took comfort from and refuge behind the view that the imperatives of fiduciary responsibility actually *precluded* an explicit consideration of sustainability factors in investment decision making. (I am not making this up.)

- Helping catalyze and institutionalize the UN Principles for Responsible Investment (PRI), an extraordinarily ambitious collective initiative that today draws together roughly 900 asset owners and managers, with combined assets under management of over $20 trillion.

Taken together, these and other UNEP FI initiatives have now created an intellectual foundation and an organizational architecture that should be sufficiently robust to lead us to the sustainability Promised Land. The fact that it has not yet done so cannot, in my view, fairly be laid at UNEP FI's door. Herding cats is not an easy undertaking, and one can indeed lead horses directly to water, but making them drink is another matter altogether.

Ms. Yasui's organizational modesty undoubtedly precludes her from making the case herself, but I suffer from no similar impediment, so I shall do it for her: in my humble opinion, UNEP FI has been the single most important organizational catalyst in driving forward the sustainable finance agenda to the point where we find it today. Unit head Paul Clements-Hunt and his exceptionally talented and committed young team have overcome formidable institutional barriers and inertia, both outside and within the UN system, and they have made an appreciable difference. I shudder to think about where we'd be today without their efforts.

But where do we go from here?

Despite UNEP FI's considerable contributions, we have yet to arrive at sustainability nirvana, and a constellation of global megatrends is militating powerfully against our ever being able to do so. What's past truly is prologue here; the real question is, what does UNEP FI—and the rest of us—do next? Let's start with a quick review of where we sit today. On the positive side of the ledger:

- For those who wish to examine and consider it carefully, we now have an extensive body of both academic and empirical evidence to buttress the sustainable finance thesis.

- There is now a nontrivial (if wildly exaggerated) body of assets currently being managed according to one version or another of sustainability principles.

- Significant progress has been made in both legitimizing and mainstreaming sustainable finance.

So far, so good. But let's examine the liability side of the sustainable finance balance sheet. A number of serious problems and challenges still remain:

- Greenwashing and organizational hypocrisy remain rampant, aided and abetted by a broad conspiracy of silence that resolutely refuses to call a spade a spade. Progress reports from many PRI signatories, for example, are disingenuous and uncritical to the point of mendacity. This is hardly a solid basis for continuous improvement going forward.

- Despite the considerable weight of both evidence and sheer logic, 99% of senior investment professionals remain unconvinced about the *investment* merits of incorporating sustainability considerations. Interestingly enough, Ms. Yasui's paper includes a table from a study examining investors' motivations for embracing sustainability. It is telling that "improving investment performance"

ranked no better than eighth, with well under 50% of the number citing "social responsibility." And, worse still, the survey was taken in what is arguably the most advanced, sophisticated region in the world in terms of sustainable finance. In short, pious rhetoric to the contrary, real investors simply do not, in their hearts, believe the sustainable investment thesis.

- The investment food chain is badly broken and perverted, with trustees and fiduciaries far too frequently playing the role of the dog that is being wagged vigorously by its tail—the investment managers and consultants.

- Given the preceding three points, it is not surprising that both the art and the science of ESG integration remain in their infancy—notwithstanding the preposterous claims by the vast majority of PRI signatories that they're already practicing it.

Just to be clear: none of the foregoing negatives is UNEP FI's fault; indeed it has battled valiantly against all of them. But we are where we are today, and it ain't pretty, folks! I would have thoroughly enjoyed Ms. Yasui's reflections on how to best confront these four challenges (and others), but I presume that such reflections would not have been conducive to her career advancement within the UN system. Nonetheless, she has given us a valuable history lesson and an important reminder that, whatever the obstacles, profound social and organizational change *can* indeed happen—and that the odds of achieving it are substantially improved when it occurs through collaborative, multi-stakeholder action.

Biography

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Embedding Environmental Risks in Finance: Current Methods and Ongoing Challenges

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Abstract

Embedding Environmental Risks in Finance: Current Methods and Ongoing Challenges

Recent studies and institutional reports have highlighted the growing materiality of environmental risks for the finance sector. Alternative risk management tools accompanied a number of these studies and reports; however, many of these tools are still in their nascence and fewer still have been mainstreamed across industries in order to provide the requisite level of information that investors need for robust decision making. By combining desktop analysis, survey results, and workshop data from the United Nations Environment Programme Finance Initiative (UNEP FI) network, we provide an overview and analysis of the current suite of environmental risk management tools and guidelines in this paper. It focuses specifically on those that address biodiversity and ecosystem services as well as water-related risks by exploring who they service and locating gaps in service in an effort to help lenders and investors understand weak spots. Significant challenges remain to embedding a growing market for innovative environmental risk frameworks into existing financial processes such as credit risk analysis and investment decision making. Despite the many significant and apparent barriers to their implementation, the paper suggests a number of internal and external steps that finance institutions could take to foster a deeper operationalization of environmental risk into the sector as a whole.

Embedding Environmental Risks in Finance: Current Methods and Ongoing Challenges

If anything is to be learned from the financial crisis in 2008, it is that all risks need to be fully identified and disclosed. As pressure increases on the world's natural resources, concerns over environmental degradation have shifted from the fringes of altruistic concern to tangible global economic losses. It is becoming increasingly apparent that incumbent frameworks for risk analysis and management do not sufficiently capture the full range of threats to the finance sector.

Similar to the pre-crisis underappreciation of systemic risk by the financial industry and its regulators, environmental risks are not receiving scrutiny commensurate with their potential impact. Systemic risk refers to the potential collapse of a system, resulting from the failure of a single entity or cluster of entities that are interlinked and interdependent (Kaufman and Scott, 2003). The avoidance of risk includes separating investment banking from commercial banking (known as the Volcker rule) in order to inhibit banks from using depositors' funds for selling or trading securities. Another important development requires banks to shore up capital cushions (known as Basel 3 and effective as of 2019), thus forcing them to increase their capital from 8% to 10.5% and to have at least 7% of this in equity. Governments are also stepping up action to deal with the "too big to fail" and "too interconnected to fail" dilemmas, in the United States for example, through the Dodd-Frank Act (*Economist* 2011). Recently, ecologists and economists alike have drawn parallels between the systemic risk of the financial sector and the systemic risk associated with ecosystems (May et al. 2008; Haldane and May 2011). Both are complex, dynamic systems that are susceptible to collapse when a tipping point is reached. Additionally, the systemic risk in both systems is not always fully understood or accounted for.

As we begin to better understand the services that ecosystems provide and then quantify the costs of environmental degradation, a number of macro trends begin to emerge that entail short-, medium-, and long-term risk for financial institutions (FIs). Macro trends include changes in land use, weather patterns, ocean currents, and sea level, as well as a rapid decline in both biodiversity and the population size of many species. As a result of these trends, FIs may be exposed to losses in the short and medium term from flooding (or conversely, water scarcity), storm surges, erosion, and higher energy costs; and in the longer term from decreased food production, increased health risks, and general instability from loss of natural resources.

Our aim in presenting this research is to better understand how water, biodiversity, and ecosystem services (BES) criteria are currently integrated into investment and lending decisions, to locate the major barriers to mainstreaming these issues, and to understand the

broader concept of risk to the sector as a whole. The analysis and presentation of these issues should serve as a baseline from which to drive development, not only toward future work that embeds a broader and deeper concept of risk within the sector, but also toward a more aggressive research agenda on environment and finance. The paper draws on stakeholder dialogues, surveys of leading FIs and the thoughts of environmental finance leaders in an attempt to

- Capture the key tools and frameworks that are being used by or developed for bankers and investors;
- Identify the main barriers to the integration of BES and water risk in financial decision making and to ascertain the bridges for resolving these challenges.

Background

Although many businesses have been addressing environmental issues for decades, until recently (that is, in the past two decades), banks have been relatively indifferent to these issues (European Environment Agency 2001; Lascelles 1993, 1997; Mulder 2007). This is largely due to general confusion concerning the importance of environmental issues paired with uncertainty about how to measure their effects. In addition, banks have difficulty reconciling short-term private gains with long-term social (and private) impacts and in communicating about both. Lastly, prices of natural resources also do not reflect possible future shortages or their unsustainable use.

Despite the mounting environmental and social challenges the world faces, only a small number of leading companies are taking significant action on these issues. Most businesses are unaware of the issues or the action needed to mitigate risks in the future. There are a multitude of initiatives and tools aimed at companies, yet many remain unsure of fundamental priorities in the journey toward better management of environmental and water issues. The multitude of local risks that can occur across large companies and complex supply chains are difficult to understand and quantify. More broadly, negative and positive environmental information is not well incorporated into the capital markets for pricing companies. Until now, the efficient market hypothesis has been weak for environmental, social, and governance (ESG) factors, due to lack of data. However, this situation is changing as more and more companies begin to provide data on a large set of metrics that are being reported by data aggregators such as Bloomberg.

Evidently, environmental risks are difficult to assess, quantify, and predict. Therefore, it is crucial to ensure that companies have robust systems and processes in place to deal with these issues. In addition to the company itself taking action, it is critical for the company to understand and influence its supply chain, mainly because sectors that source large quantities of natural resources from suppliers are the most sensitive to risk. With the

emergence of better data from sources such as the Carbon Disclosure Project for Water Disclosure and Bloomberg, assessment and quantification of environmental risks is improving.

The financial sector has a key role to play in identifying and quantifying these risks and incorporating them into decision making. When FIs embed ESG related risks into their investment decisions, it drives their clients to better account for externalities on the ground. The first European and U.S. banks to integrate environmental considerations into their credit lending activities did so roughly two decades ago (Weber et al. 2008; Thompson and Cowton 2004). However, the types of environmental risks that are addressed are often those required by legislation or that make direct short-term business sense (Coulson 2002). More "exotic" environmental risks, such as water scarcity, species loss, and ecosystem degradation, are either overlooked completely or not addressed systematically by the majority of large banks (Mulder and Koellner, forthcoming).

In general, environmental risk is still seen as an extraneous issue in mainstream finance and investment; nevertheless, as stipulated above, a growing number of tools and frameworks in their nascence are attempting to tackle the issue of integrating environmental risk into financial analysis, products, and decision making.

One commonly discussed setback is scale. Adding another layer of complexity in the form of ESG data can often seem overwhelming with so many companies and assets to assess. For example, an asset manager's portfolio may contain hundreds of companies that are potentially exposed to every aspect of biodiversity and water risks. Ultimately, it is not the role of the investor to advise companies on the risks they face, but companies need to articulate their data in a comparable way that will then make sense in traditional financial analysis.

Analytical Framework

Lessons from the financial crisis indicate that FIs did not, and still do not, fully recognize the importance of systemic risk, either as it pertains to the sustainability of the finance sector or as repercussions on society as a whole. In this paper, environmental risks are posited as another form of systemic risk, as they relate to water and BES.

Biodiversity is commonly defined as "the variability among living organisms, which includes the diversity at ecosystem, species and genetic levels," as stated in Article 2 of the Convention on Biological Diversity. Humankind benefits from a multitude of resources and processes that are supplied by natural ecosystems. Collectively, these benefits are known as ecosystem services and include products such as clean drinking water and processes such as the decomposition of wastes. The Millennium Ecosystem

Assessment (2005) identified four main categories of ecosystem services: provisioning, regulating, cultural, and supporting. In the context of this article and to add clarity, these terms are combined under the term *biodiversity and ecosystem services*, or BES. Water risks relate to both quantity and quality issues, which not only have consequences for riparian ecosystems and human health, but also directly impact business operations in water intensive sectors, including but not limited to agribusiness, energy and mining.

As highlighted in the introduction, this paper aims to identify and provide an overview of the tools and frameworks to assess BES and water risks, and to identify the gaps in meeting the needs of the finance sector. Other objectives include outlining the key drivers for the materiality of BES and water risk in the finance sector and identifying the main barriers to integrating these issues in financial decision making. In order to address these issues, data have been gathered from desktop literature review, a series of workshops, a survey, and discussions in which the above-mentioned issues were discussed with a number of UNEP FI members and nonmembers alike throughout 2010 and 2011 (4 workshops; 100 stakeholders participating; 48 survey respondents). Qualitative data from these surveys and workshops were then coded and analyzed using MaxQDA, the software program for qualitative text analysis. Results are not intended to provide a comprehensive guide to the full suite of tools and frameworks available to bankers and investors for the management of environmental risk; rather, they present a snap shot of the methods and initiatives that a cross section of FIs are using to address environmental risk.

Results and Discussion

Our analysis of recent surveys from UNEP FI (2010) and working group discussions indicate that the motivations that account for water and BES risk are primarily related to reputation and image. Campaigns and initiatives by non-governmental organizations (NGOs) and other stakeholders play a dominant role in the innovation and uptake of environmentally oriented information, policies, and risk assessment strategies within a number of banks and investment institutions. More interestingly, a survey showed that financial professionals are moving away from the historical emphasis of focusing only on reputational risk issues, by indicating that BES and water issues can lead to greater exposure to regulatory risk by banks, operational risk for clients, and hence enhanced credit risk for lenders, and legal liability risk.

There are also some key differences between the drivers affecting water risk and those concerning BES risks. Water is highly interlinked with climate, and some banks have indicated that a growing focus on climate change risk has led to a heightened awareness that business exposure to water risks must also be better understood. Water risk is seen as a potential cost issue and as a potential disruption to operations from flooding or drought. BES drivers on the other hand still remain less tangible or less easily monetized, which

leads to a stronger reliance on external drivers such as biodiversity campaigns from NGOs and regional or intergovernmental bodies, and innovations through mechanisms such as Reduced Emissions from Deforestation and Forest Degradation in Developing Countries (REDD+).

Risk Frameworks and Tools

Key tools and frameworks are currently available to help different subsectors to better understand and incorporate BES and water risk into financial decision making (Table 1).

Table 1: Tools and Guidance Frameworks for Water and BES Risks

Tool Type*	Water Risks	Target Audience	BES Risks	Target Audience
Databases / Guidance / Training	UNEP FI Chief Liquidity Series	Bankers and investors	UNEP-World Conservation Monitoring Centre & Integrated Biodiversity Assessment Tool (IBAT)	Extractives and other businesses
	CERES Investor Network on Water	Investors	WRI's Ecosystem Services Review	Private sector
	IFC Online Training on Environmental and Social Risk for Sustainability	Finance sector	IFC Online Training on Environmental and Social Risk for Sustainability	Finance sector
	UNEP FI: Environmental and Social Risk Analysis (ESRA) training	Finance sector	UNEP FI: Environmental and Social Risk Analysis (ESRA) training	Finance sector
	CEO Water Mandate: online information portal	Private sector	TEEB: The Ecosystem Services Review	Business & Finance sectors
			PWC Training: Master Classes and Peer-to-Peer learning	Internal stakeholders
			Global High Conservation Value (HCV) Toolkit	Forest managers, investors, donors, and conservation practitioners
Metrics / Benchmarking	CERES: framework to assess and benchmark corporate water management for engagement purposes	Investors	Natural Value Initiative: Ecosystem Services Benchmark	Investors
			Global Footprint Network: Ecological Footprint Data	Private sector including investors

Tool Type*	Water Risks	Target Audience	BES Risks	Target Audience
Management & Assessment Frameworks – Performance Standards	IFC Performance Standards (1, 3 &6)	Finance sector	IFC Performance Standards 6 (Biodiversity Conservation & Sustainable Natural Resource Management)	Finance sector
	IFC Environmental Health and Safety (EHS) Guidelines	Finance sector	IFC Environment, Health and Safety Guidelines (EHS)	Finance sector
	Equator Principles framework, underpinned by the IFC Performance Standards and EHS Guidelines	Project finance	Equator Principles framework, underpinned by the IFC Performance Standards and EHS Guidelines	Project finance
	DEG & WWF: Water Risk Assessment Tool	Investors and bankers	World Business Council for Sustainable Development (WBCSD) Guide to Corporate Ecosystem Evaluation	Business and Governments
	WRI Aqueduct: database of water risk indicators RepRisk	Investors	WBCSD & PWC Sustainable Forest Finance Toolkit	Financiers of forest-related sectors
	Water Footprint Network	Private sector	Forest Footprint Disclosure (FFD)	Investors
	WBCSD Global Water Tool	Private sector	Business and Biodiversity Offset Program (BBOP) Principles, Criteria and Indicators	Private sector
			Roundtable on Sustainable Palm Oil Principles, Criteria and Indicators	Palm oil companies, buyers of palm oil, and bankers
Reporting	CDP Water Disclosure Project	Investors	Global Reporting Initiative (GRI)	Investors
	Global Reporting Initiative	Investors	Integrated Reporting	Private sector
	Integrated Reporting	Private sector		

Source: UNEP 2011.

While there are a number of tools and initiatives focused on assessing and demonstrating the materiality of financial risks related to BES and water, it is how organizations use these tools that will determine whether or not these risks are properly factored into financial decision making. Encouragingly, a number of FIs have developed their own internal products and initiatives to either engage with clients on issues such as resources efficiency or to screen investments (such as environmental social risk indicators, internal sustainability criteria, individual statements and alliances).

A recent review of 50 large banks revealed that 33% have Environmental and Social Risk Assessment policies in place that are often based on the World Bank's Environmental Health and Safety guidelines (Mulder and Koellner, forthcoming). More interestingly, 32% of the surveyed banks have developed sector specific guidelines for clients and projects in the forestry sector. These guidelines often stipulate that the bank refrains from investing or financing any activities in protected areas—"red-lining investments"—or involving illegal logging, and that they support certification for sustainably harvested timber (such as the Forest Stewardship Council (FSC) certification). For clients that source wood from countries with a high prevalence of illegal logging, JPMorgan Chase now sets, for example, deadlines for verifying the legal origin of the wood (FSC 2005). On the other hand, many fewer banks have developed sector specific guidelines on biodiversity and ecosystems for: oil and gas (20%), mining (18%), agriculture (16%), construction and infrastructure (8%), fisheries sector (6%), and tourism and leisure (4%) (Mulder and Koellner, forthcoming). Partnerships with NGOs were also a recurrent theme within member organizations, which draw on the expertise of international environmental organizations to better understand how BES or water risks might be assessed across a portfolio.

A number of asset managers and investors also indicated that in addition to the tools listed above, engagement and divestment were valuable approaches for driving more responsible investment, although divestment was seen as a last resort and is rarely employed. Interestingly, a number of FIs suggested that information on these risks needed to be easy and accessible in order to be useful. However, queries are often raised regarding the expediency of some of the main reporting and disclosure initiatives for targeted use (that is, integration into investment decision making). Another challenge for disclosure projects is the handling of non-listed (private equity) companies, since their authority originates from the investment community. The International Integrated Reporting Committee is working toward solutions to some of these perceived problems in order to deliver Integrated Reporting (IR) information that can easily be incorporated into investment decision making. Innovation in and integration of BES and water issues appears to take place mostly in lending and less so in asset management or other forms of equity investment. Unsurprisingly, the Equator Principles (EP) and the underlying IFC Performance Standards dominate the landscape in project finance, with many viewing the process as an important one for mitigating the risks in project finance.

Barriers and Bridges to Integration

It is clear that the natural capital upon which society depends is not being adequately recognized, valued, or preserved. Common barriers were identified as major challenges to the implementation or mainstreaming of BES and water risk frameworks into financial decision making. Despite these major barriers, there are also some key examples of how

FIs are overcoming the challenges. In some areas of innovation, investors can play forward-thinking roles in treating natural capital issues as drivers of shareholder value. While regulatory drivers provide a vital stick to the finance industry, market drivers and consumer choices (Forest Stewardship Council, Marine Stewardship Council), can be the carrots that motivate increased positive behavior. FIs should be looking at where those eco-conscious consumer trends are heading, and how their institutions are placed to support developments in market behavior.

It is helpful to view both the major challenges and the potential solutions that exist for better integrating environmental risk factors into finance (Table 2). The potential solutions represent goals identified by stakeholders and some strategies already implemented within various organizations.

Table 2: Challenges and Solutions to Embedding Water and BES Risks in the Finance Sector

Key Challenge	Specific Barriers	Potential Solutions
Business Case	On the risk side there is a need for more iconic, compelling examples that demonstrate and quantify the value of natural capital. In addition, it appears as though there are few investable projects and companies that fully integrate BES and water risks in their supply chain and business operations.	Build up the business case for investing in BES in particular, but also water. Highlight opportunities clearly so as to help eliminate the assumption that few projects and companies that integrate BES and water risks exist.
	Lack of valuation and metrics	Need to agree on proxies and investment schemes. Outline "how to" methodology for integrating well defined BES and water related metrics into decision making standards.
	Lack of incentive structure: difficult not to do "dirty" business	Include ESG analysts on investment committees and have them work closely with portfolio managers. Focus on addressing investments in banks investors, rather than simply engaging with clients.
	Insufficient screening criteria: lack of appropriate financial package to support innovative companies.	Improve offerings for small and medium enterprises (SMEs), as most opportunity for BES resides in the SME space.

Key Challenge	Specific Barriers	Potential Solutions
	Costs around BES/water don't accrue to the company (private vs. public wealth).	Link approach to bonuses, which can be based on performance as well as ESG criteria and ratings.
More difficult to quantify and monetize than climate risk/action	Climate risk is clearly monetized e.g. there are models on pricing climate risks but not yet for water/BES risks (despite the fact that water can have a price).	Increase vital NGO Partnerships, such as WWF & DEG joint project, which assess and quantify water/BES risks.
Lack of Sophistication - Skills Gap	Risk models: lack of transparency/sophistication	Role of UN PRI / UNEP FI to provide training, however investors need to commit to capacity building and integration of learned skills/tools.
	Unsophisticated/immature approach: market leaders	Benchmarking exercises (e.g., NVI) highlight lack of sophistication and demonstrate the need for increased peer-to-peer learning.
	Client side: lack of transparency within the supply chain	Demonstrate liabilities under the law/ regulatory risks. Companies should ask suppliers to respond to the CDP (both carbon and water).
	Credit Ratings Agencies (CRAs): credit risk and credit ratings do not factor in ESG data.	CRAs should incorporate ESG data into their models. The demand for this information must come from FIs.
	Financial institutions: lack of sophistication in understanding critical factors affecting both sectors and countries.	Capacity building through existing networks such as Equator Principles Association or UNEP FI ESG data should feed into credit risk analysis. Increased sustainability performance disclosure and integration into mainstream financial platforms such as Bloomberg Securities regulators and governments should strengthen ESG disclosure requirements.
	Limitations of disclosure projects	Closer collaboration between investors and disclosure projects (though platforms such as UN PRI and UNEP FI) to develop a more customized approach
Integration across sectors/scales?	Limitation of moving beyond simply SRI/ESG analysts/departments	Again, include ESG analysts on investment committees and have them work closely with portfolio managers.

Key Challenge	Specific Barriers	Potential Solutions
	Temporal mismatch between long-term investment timelines & rating timelines (from CRAs)	Closer collaboration between investors and CRAs (though platforms and projects) to better address longer term risk assessment.
	Temporal mismatch between environmental materiality and investment decision making	Closer collaboration between investors, rating institutions, and NGOs to better address longer term creeping systemic risks.
Communication/ Language barriers -	Education / communications: much of the mainstream finance sector is not using this information.	Get mainstream FIs (e.g. Bloomberg) to include water and BES information within their platforms.
	Business language of biodiversity is missing.	Improve capacity of financiers: increased training (PwC/UNEP FI). Educate bankers internally and increase the integration of scientific information in the finance sector.
	Metrics: Error range too high to be understood or accepted by risk managers in the finance sector.	Improve transparency of uncertainties.
Fragmentation - Harmonization	Lack of standards/cohesion	Harmonize standards across the board to assist with mainstreaming.
	Banks using EPs	Assist EPs to move beyond project finance. Create equivalent for other types of FIs.
	Information is not easily accessible across different sectors/resources (many separate suppliers).	Full integration of nonfinancial data information within financial data suppliers.
Regulation & Enforcement inadequate	Lack of pricing mechanisms, mitigation and methods	FIs should call on policy makers to implement the right incentive structures.
	Biodiversity as a policy issue has proved very difficult (especially in the application of the mitigation hierarchy).	Clarify definitions, improve business case, and build capacity within both FIs and governments around these material issues.
	Regulatory indicators act as disincentives.	Call for improved regulation leading to improved incentives for FIs.

Source: UNEP 2011.

Many of these challenges are interlinked, and most of the solutions are not unique to the particular challenge that they address. Perhaps the main challenge with ESG data is that much of it is qualitative and needs to be converted into meaningful quantitative metrics. A recent study "Rate the Raters" (SustainAbility, 2010) identified a number of pitfalls with the approach of ESG rating agencies, in terms of their highly qualitative approach and also the lack of transparency in their rating models. In order for mainstream financial analysis to successfully incorporate environmental factors into their existing models, data needs to be better aggregated and synthesized into standardized financial metrics.
Data availability, quality, and uncertainty are also key challenges for the ESG and the sustainable finance and responsible investment (SF/RI) research industry. Despite recent growth, the speed at which this collective community is attempting to cover such a large landscape of companies and sectors with mainly public information results in a major undertaking. Encouragingly, a number of mainstream financial agencies such as Bloomberg, Thomson Reuters, and Risk Analytics are beginning to move into this space; however, the depth of their commitment has yet to be proven. The regulatory challenge remains a complex and crucially strategic issue. While regulatory signals for increased financing of cleaner business are still wanting, in other areas, such as the CBD fulfillment in Europe, the limitations of regulation and the capabilities of strong institutions to overcome these challenges have been identified.

Some of the most recognized initiatives within finance have been disclosure projects such as the Carbon Disclosure Project (CDP) and the Forest Footprint Disclosure (FFD), but significant challenges are evident in ensuring that investors are actually using this information within investment decision making. Disclosure projects should be reflecting on whether they are indeed asking the right questions, not just for increased engagement but also to feed directly into investment decision making. Improved collaboration between investors and disclosure projects and using questionnaires such as the SAM Sustainability Index would be useful media forms through which to ensure that the generated information is actually being integrated; it could also drive companies to report on meeting investor needs.

Significantly, the percentage of companies covered through Bloomberg and other market data platforms that disclose company sustainability performance is still exceedingly low. This pervasive lack of transparency continues to act as a barrier to long-term sustainable investment; however, this barrier is being addressed through initiatives such as the UN PRI Sustainable Stock Exchange Global Dialogue (UN PRI 2010) and the Integrated Reporting Initiative (http://www.theiirc.org/).

Additionally, the scale of engagement differs between investment and banking companies and between debt and lending companies. Since an investor may likely have a narrow relationship with a portfolio company, engagement is limited and therefore needs to be highly organized. A bank that provides credit loans, on the other hand, would have a more direct relationship, and thus stronger links through its engagement. However, having a common methodology for the use of these tools is essential for increased proactive engagement—with the end goal of encouraging improved environmental stewardship.

Conclusion

At the end of the day, FIs should aim to ensure long-term growth of revenues and profits for their institutions through more risk-inclusive models that factor in ESG risks, including BES and water, in a systemic way. This will ensure that BES, water, and other ESG issues are better accounted for than they are at present. Despite a growing recognition of this core concept, integrating risks and opportunities associated with water and BES remain highly complex and often unpopular. In general, results from UNEP FI stakeholders point to an increasing proliferation of tools and guidance on environmental risk for the finance sector as a whole. However, this proliferation in and of itself can increase the complexity of integrating environmental risks into finance, and must be addressed.

There is a growing risk that nonstandardized solutions will continue to increase the complexity of integrating multiple tools into investment decision making. A broader adaptation of tools such as the EP and IFC performance standards, combined with more robust, readily available metrics and databases, may facilitate the integration of water and BES risks into mainstream financial decision making.

Improved understanding of BES and water risk is essential; however, the majority of clients and investee companies must match this understanding with transparent disclosure. There is common agreement that leadership and best practices must be rewarded and supported through improved incentives and regulations. Leaders who advocate such improvements must be championed for providing a solid business case for mainstreaming water and BES risks and opportunities. Furthermore, efforts to quantify the global environmental costs and loss of natural capital (UN PRI and UNEP FI 2010) should be both escalated and refined. With annual environmental costs from global human activity in 2008 estimated at US$ 6.6 trillion, potentially rising to US$ 28.6 trillion per year in 2050 under "business as usual" scenarios, this risk can no longer take a back seat to mainstream financial indicators. Despite the growing range of products introduced to address environmental risk in the finance sector, ongoing difficulties remain in translating awareness into actual policies and lending and investment practices.

We have outlined a variety of tools and potential solutions that are vital in the movement toward fully integrating material environmental risk into financial models and decision making. Awareness is growing of the need for policy-makers, businesses, citizens, and FIs to quantify and value their impact on BES and water, but significant challenges must be overcome. Together we must all contribute to actively restructuring the current financial model we depend upon.

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A Commentary on *Embedding Environmental Risks in Finance: Current Methods and Ongoing Challenges*

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Material risks are growing for the financial sector, and, "Embedding Environmental Risks in Finance," makes a valuable contribution in reviewing and commenting on the range of methodologies available to investors for identifying and managing these risks. It is remarkable that so few financial institutions use the tools, many of which are actually supply-led rather than demand-led. For most financial institutions, the business case for investing in sustainability appears far weaker than the case for conducting business as usual. The reason for this is that the costs of using natural capital are not priced into the production of goods and services. Except in certain circumstances, regulatory frameworks remain too weak to make a material change in this position.

Change is coming, albeit slowly. The reputational risks of destroying natural capital with little regard for the impacts, whether they be on Earth's atmosphere, rainforests, or oceans, are increasingly measurable in share price falls, but these tend to be transitory and rarely result in wholesale bankruptcy. Big companies especially can take it on the chin, but neither their employees nor their customers wish to be associated with "bad" companies. Regulatory risk can have a significant impact, and commodities causing, for example, the illegal conversion of tropical forests may be increasingly excluded from mature markets (such as those of the United States and Europe) in the future.

Materiality, defined as the extent to which environmental risks can be financially quantified as having an impact on the future costs of goods and services and hence a company's performance, remains elusive. Because biodiversity and ecosystem services are treated as externalities and do not appear on balance sheets, it is hard for investors to assess positive or negative impacts on future share value. More research is needed here.

In addition to offering a comprehensive overview of the wide range of tools now available, the Hill et al. review provides investors with insights that can help them navigate this complex and evolving assessment process. Presented by UNEP Finance Initiative, with contributions by Citi and JP Morgan, the paper answers the question of how to apply each tool to the assessment of systemic environmental risk related to water, biodiversity, and ecosystem services within a portfolio. The discussion of key tools and frameworks includes an examination of barriers to implementation, and thus highlights as an opportunity the increasing need for data aggregation in the environmental sector.

There are some omissions, such as the Forest Footprint Disclosure Project, which for some reason is left off the list of tools and frameworks, though it is briefly mentioned later in the text. The paper could offer stronger advocation of nontraditional financial analysis as a means of capturing the potentially immense values associated with ecosystem services, such as has been promoted by the Economics of Ecosystems and Biodiversity (TEEB) review. TEEB hopes to increase investor consideration of the currently often-invisible role of natural capital in investor portfolios. The recent work by PricewaterhouseCoopers LLP and Trucost PLC with sport lifestyle company PUMA in delivering the first "corporate natural capital accounts" is an example of progress.

From the survey data, it would be interesting to know how many of the 48 investors have actually invested or disinvested on the basis of using the frameworks and tools currently on offer, and what questions investors would like to see answered that are not currently being answered.

A clear message is that investors are looking for simplicity—and the tools currently available generally offer complexity. This needs to be addressed. The role of credit rating in relation to natural capital use offers possibilities, as do standardization and some form of index that indicates comparative corporate performance. The mainstream finance industry must be clearer about its future needs in a potentially transformed fairer and greener 21st century economy.

Biography

Andrew W. Mitchell is a leading authority on forest canopies and related climate change issues. His extensive field experience in Asia, Africa, and Latin America combines with a thirty-year career spanning research, journalism, broadcasting, policy, and global project management. In 2001, he founded the Global Canopy Programme (GCP), an international network linking 38 leading scientific institutions in 19 countries engaged in research, conservation, and education for investigating the impact of climate change on biodiversity and ecosystem services in forest canopies. In his capacity as founder and director, Andrew has coordinated the growth of GCP into an influential alliance, using networks developed within the international science community to offer a global perspective on science, policy and finance for forests.

Andrew is a former Research Associate of the Zoology Department University of Oxford, and was the former Rufford Research Fellow in Environmental Understanding, at Green College. He is the author of seven books, including *The Enchanted Canopy*, and many articles for newspapers and magazines. His work has been translated into six languages.

Barriers and Drivers to Renewable Energy Investment in Sub-Saharan Africa[*]

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Abstract

Barriers and Drivers to Renewable Energy Investment in Sub-Saharan Africa

Sub-Saharan Africa has the world's lowest electricity access rate, at only 26%. The rural electricity access rate is only 8%, with 85% of the population relying on biomass for energy. This challenging energy security situation is in marked contrast with the abundance of natural resources in the sub-Saharan Africa region, which contains huge potential for electricity generation from renewable energy. Most importantly, renewable energy can put an end to the reliance of many countries on expensive and volatile imports of fossil fuels such as oil, and can be an avenue for Africa to better exploit the economic opportunities offered by international carbon markets. This article questions why the up-front investment needed, particularly from the private sector, to seize these opportunities and to accelerate the renewable energy deployment that has to date not materialized in a region where it is much needed. An analysis of the drivers and barriers to renewable electricity expansion—including the cost and profitability of renewable energy, the structure and design of the local energy sector and the risk landscape in sub-Saharan Africa—shows that to secure private investment, public commitment needs to be demonstrated at the local level. However, understanding is also needed, both locally and internationally, of how private investment works and how it can be effectively promoted and mobilized through smart public intervention.

[*] This article will be published as a chapter in the forthcoming book *Handbuch Finanzierung Erneuerbarer Energien*.

Barriers and Drivers to Renewable Energy Investment in Sub-Saharan Africa

Sub-Saharan Africa has the world's lowest electricity access rate, at only 26%. The rural electricity access rate is only 8%, with 85% of the population relying on biomass for energy. This fundamental lack of electricity supply does little to help poverty levels—70% of household income is spent on energy (such as diesel, kerosene, and charcoal); and is causing substantial deforestation—0.4 million hectares of forest are cleared each year in Africa (Ram 2006, 2). As well as being costly and inefficient, indoor cooking systems are highly dangerous—indoor air pollution from using biomass and coal is projected to cause more than 1.5 million premature deaths in Africa by 2030 (UNEP 2011, 19). Even in urban situations with access to electricity, this is unreliable, with frequent power outages creating difficulties and increasing costs—the overall economic costs of power shortages in sub-Saharan Africa typically range between one and four percent of GDP (African Development Bank 2010, 3). Please note that all references to sub-Saharan Africa in this article exclude South Africa unless otherwise stated.

While, as a whole, sub-Saharan Africa achieved average GDP and energy demand growth rates in excess of 10% from 1998–2008, the supply of grid-based electricity generation grew on average by only 5% over the same time period (U.S. EIA 2011; World Bank 2011). To meet increasing demand and support economic growth, the power sector in Africa needs to install an estimated 7,000 megawatts (MW) of new generation capacity each year (African Development Bank 2010, 3). Financing the development of the energy sector in sub-Saharan Africa is expected to cost USD 41 billion per year, 6.4% of GDP (ibid., 6). A large financing gap is created in the power sector through heavy spending needed for existing operating expenditure, with little left to fund long-term investments and address the power supply crisis. Unless stronger commitments and effective policy measures are taken to reverse current trends, half the population in SSA will still be without electricity by 2030, and the proportion of the population relying on traditional fuels for household energy needs will remain highest compared to all world regions (UN-Energy/Africa 2011, 3).

The challenging energy security situation is in marked contrast with the abundance of natural resources of the sub-Saharan Africa region, where there is huge potential for electricity generation from renewable energy. Most countries in the region have renewable energy potential many times the current energy demand that is feasible to exploit with current technology, including hydro-potential (estimated around 1,750 TWh), geothermal (estimated at 9,000 MW), wind, biomass, and solar (Deichmann and Meisner 2010, 5193). But to date, the benefits of renewable energy have not been seized, including the modular design of renewable energy distribution, which makes it particularly appropriate for remote and rural areas that can only be reached with off-grid technologies

(African Development Bank 2010). Most importantly, renewable energy can put an end to the reliance of many countries on expensive and volatile imports of fossil fuels such as oil, and can be an avenue for Africa to better exploit the economic opportunities offered by international carbon markets. This article analyzes why the up-front investment needed, particularly from the private sector, to seize these opportunities and accelerate renewable energy deployment has to date not materialized in a region that is in dire need of it.

Risk and Return as the Key Determinant of Investor Behavior

From a private sector perspective, each decision made on whether or not to undertake and finance any given project, will be influenced by a wide set of variables. In order to understand how these variables will influence the final decision, it is helpful to recognize that they will have an impact on the project, from a financial perspective, essentially through its forecasted risk-return profile, perceived or real.

Financial return and risk are not stand-alone categories; project sponsors, lenders, and investors want to make a return proportional to the level of risk they undertake. As with all other classes of projects and investment, renewable energy investment becomes more likely and frequent if the perceived levels of investment risk are reduced for a given level of return, or returns are increased for any given level of risk. The impressive growth in sustainable energy investment throughout the last decade in many parts of the world has been triggered by such shifts in risk and return.

Geographically, this rapid growth has taken place very unevenly, and the region of sub-Saharan Africa, despite considerable endowments with renewable energy and despite its dire need for electrification, belongs to those regions with least renewable energy development. Therefore, this article aims to provide answers to the following questions:

Why is sub-Saharan Africa failing to expand electricity generation from renewable sources? What are the barriers to such expansion? What is keeping the risk-return profile of renewable energy investments in sub-Saharan Africa unattractive, and projects commercially unviable? What can be learned from the modest successes of a few sub-Saharan African countries for replication in others? What was done in these countries to improve the risk-return profile of renewable energy and unlock investment?

Part 1 provides an overview of broad developments in the electricity markets of the region over the last decade. Against this background, the following sections provide an analysis of what is driving and what is impeding private investment for renewable energy solutions.

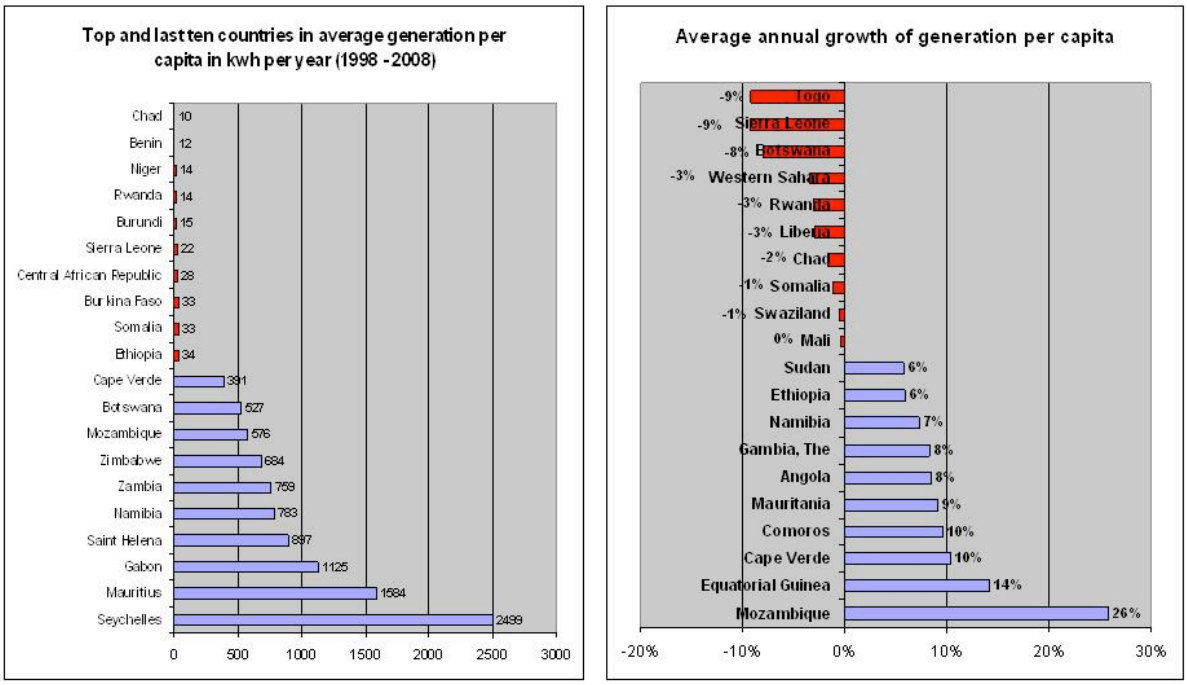
Part 1: The Big Picture—Electricity Generation Trends in Sub-Sahara Africa Over The Last Decade

Overall grid-connected electricity generation in the countries of sub-Saharan Africa has grown by an impressive 70% (from 73 to 123 terawatt hours) in the 10 years from 1998 to 2008, translating into an average annual growth rate of 6%. Coupled with a population growth of 30% in those same countries over the same time period, the overall result has been an increase of 31% in the per capita generation of electricity across all countries concerned. It should be noted that the analysis in this article only makes use of generation-related data and ignores data on actual electricity consumption, hence ignoring cross-boundary transfers of electricity.

Despite the low starting point of only 128 kilowatt-hours of average generation per capita in 1998 and 73 terawatt hours of total generation in that same year, these developments are encouraging. In comparison, total electricity generation in Latin America and the Caribbean grew by "only" 44% in that same time period. The expansion of electrical provision, however, has been unevenly spread throughout the region (Figure 1).

Recent growth in the area of renewable energy has been equally strong, with total electricity generation from renewable sources growing by 72% from 1998 to 2008 (from 45 to 78 terawatt hours per year). This means that 66% of all new electricity generated in sub-Saharan Africa after 1998 has come from renewable sources. However, most of this growth has essentially meant an increase in hydro-based electricity generation, such as in Mozambique, Zambia, Namibia, Angola, and Zimbabwe. While being a renewable resource, hydropower can also be considered a conventional type of electricity generation—in terms of costs it is competitive with fossil-fuel-based generation, and represents a mature and proven technology with a long track record; it is therefore deployable and financeable with relative ease. Furthermore, hydroelectric development can result in serious environmental damage as well as social conflict, particularly in the case of large-scale, dam-based generation, and it is immediately exposed to the effects of drought, a pertinent risk category in a sub-Saharan context (UNESCA & UNEP 2007). Although other innovative forms of renewable energy technologies demonstrate great potential at less social and environmental cost and are often more suited to many African countries with scarce hydrological but vast wind, solar, and biomass resources, these alternatives have to date been largely neglected.

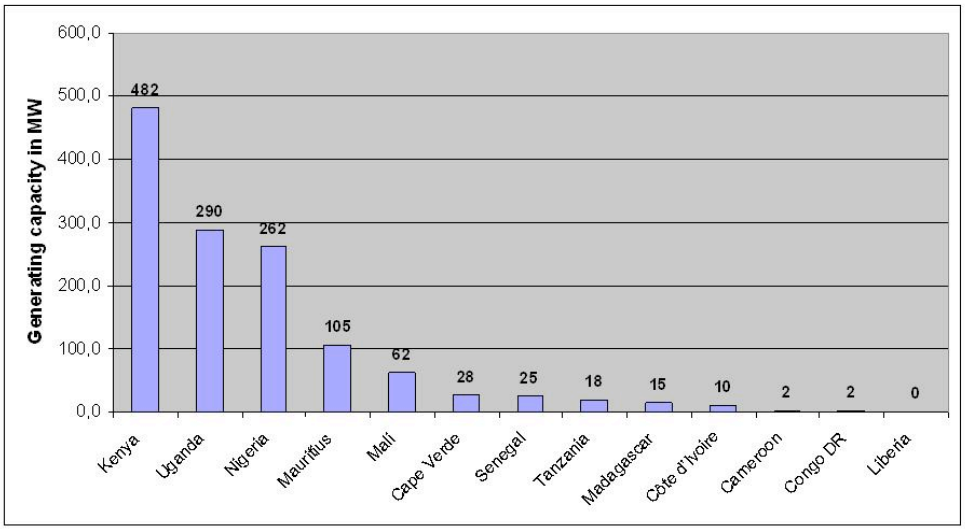
Figure 1: **Top and Bottom 10 Countries in Electricity Generation per Capita and Annual Growth of Generation per Capita**



Source: Remco Fischer, UNEP Finance Initiative.

In contrast to the recent developments seen in hydro-based electricity generation, the current status of non-hydro electricity generation from renewable sources in sub-Saharan African countries is disappointing. According to data from the U.S. Energy Information Agency (U.S. EIA 2011) this type of electricity is generated only in a handful of countries including Kenya, Ivory Coast, Senegal, Gabon, Ethiopia, Cape Verde, Togo, and Eritrea. The only sub-Saharan African country where electricity generation from renewable, non-hydro energy sources has played a somewhat significant role over the last decade is Kenya. In 2008 one fifth (21%) of the Kenyan national electricity mix came from such sources, while all renewable energy, including hydro, reached a level of 62%. Notwithstanding, data from the current pipeline of CDM projects appears to suggest that increased renewable energy interest has started to materialize on the continent after 2008 (see Figure 2).

Figure 2: Total Renewable Energy Capacity in the 2011 CDM Pipeline per Country



Source: Remco Fischer, UNEP Finance Initiative.

These observations raise important questions regarding the only marginal uptake of non-hydro renewable energy technologies in the region despite immense potentials. The following sections explore this by providing an overview and discussion of the barriers faced by the proponents of renewable energy technologies, including in particular, their financial backers.

Part 2: Drivers and Barriers to Investments in Developing Countries

All factors and variables that shift or alter the risk-return profile of any given renewable energy project or investment will act as either drivers or barriers. In the context of energy and, particularly, renewable energy projects, drivers and barriers can be categorized as follows: (i) those related to the technology at hand or the physical location of the project; or (ii) those related to the partners and counterparts in the project; or (iii) most importantly, those variables that are related to the local jurisdiction, such as the general economic environment, the institutional landscape and political stability of the location of the project, and the reliability of local regulation.

These categories play an important role in all commercial ventures, and their consideration is standard practice in any project viability assessment or financial due diligence process. The technical characteristics and features of a technology, for instance, its competitiveness with other technologies or its likely performance given the physical characteristics of the project site, will be important issues to consider in any jurisdiction of the world. This applies also to the track record and skills of project partners and counterparts.

In particular, the last category will play a significant role in the specific context of investments in developing countries, and even more so when it comes to investments in the area of renewable energy. This is due to two fundamental aspects, which are discussed in fuller detail below:

> *The need for public intervention*—Despite the fact that many renewable energy technologies have gained competitively against conventional technologies, their implementation remains inferior in purely financial terms. In order to be viable at all, renewable energy needs regulation and incentives to create a level playing field between innovative, more expensive but clean technologies on the one hand, and the proven, cheaper but dirtier technologies on the other. Such regulation and incentives will ultimately have to be put in place by policy makers and regulators and implemented by local governments under a legal framework. The key role of public actors in enabling private actors to deploy, install, operate, and finance renewable energy technologies makes it imperative that project sponsors and investors can trust that these incentives will remain in place over the lifetime of projects and that public institutions and the legal system are stable and can be trusted.
>
> *Public intervention in developing countries*—In developing countries, public institutions and legal systems often lack the stability, ability, and reliability over the medium to long term to put in place and enforce laws and private sector regulation in general, as well as supportive incentives for renewable energy in particular.

It does not come as a surprise, therefore, that in the literature the failure to expand electricity generation from renewable sources in developing countries, including in sub-Saharan Africa, is—not exclusively but mostly—linked with barriers that originate from the local characteristics of public governance, energy regulation, law enforceability, and institutional stability.

More specifically, three critical factors appear to influence and determine the levels of investment in, and the growth of, renewable energy capacity in countries across sub-Saharan Africa: (i) the cost and profitability of renewable energy (see Part 3); (ii) the structure and design of the local energy sector (see Part 4); and (iii) the risk landscape in sub-Saharan Africa (see Part 5).

Part 3: The Cost and Profitability of Renewable Energy in Sub-Saharan Africa

The risk-return profile of any investment opportunity will be strongly influenced by the financial profitability of the underlying technology and the extent to which it is competitive with other technologies. While it is still generally the case that, in a complete policy-vacuum and even under the consideration of total life-cycle costs, electricity generation from renewable sources is more expensive than it is from conventional sources, additional aspects further deteriorate the competitiveness of, and prospects for, renewable energy investment in a sub-Saharan Africa context.

The cost of electricity generation per se and poverty—The cost of electricity in most of sub-Saharan Africa is exceptionally high already, due to a combination of the small size of the electricity markets and the resulting lack of economies of scale; the common reliance on expensive oil-based generation; and other inefficiencies such as low historic levels of maintenance investment and resulting inefficiencies and electricity losses in generation and distribution. The average electricity generation cost in sub-Saharan Africa amounts to US$0.18 per kilowatt-hour with an average effective tariff of US$0.14 per kilowatt-hour when compared with tariffs of US$0.04 per kilowatt-hour in South Asia and $0.07 in East Asia (African Development Bank 2010). This means that in the quest for the quick expansion of energy access, particularly to poor communities, and in light of tight public budgets with only limited interest from private investors, cost efficiency and minimization are likely to be high priorities for policy-makers, developers, and the local population. These priorities place the most cost-efficient options, usually gas and particularly coal, as the preferred political choice. The picture changes, however, in the context of rural communities that are distant from current grid infrastructure—here renewable energy can represent the most cost-efficient option through small-scale, off-grid applications such as rooftop PV or solar water heaters (Deichmann and Meisner 2010).

The capital intensity of renewable energy options in a challenging risk landscape—In more advanced economies, renewable energy technologies are becoming increasingly competitive on the back of innovation as well as from long-term upward price trends for fossil and nuclear fuels. (The price of oil in 2009, for instance, was US$59.21 per barrel and is predicted to be US$135.22 per barrel in 2035, an increase of 125%. The price of natural gas was US$3.33 per 1,000 cubic feet in 2009 and is predicted to be US$8.06 in 2035, an increase of 142%.). In other words, much of the competitiveness gains of renewable energy technologies are attributable to their relatively favorable OPEX profile (the level of ongoing operations-related expenditure), while in terms of CAPEX (up-front capital investment expenditure), renewable energy technologies feature a higher level of

capital intensity. However, the circumstances in many countries of sub-Saharan Africa will mean that the CAPEX associated with different energy options will often play a more important role in assessments and decision making than the corresponding OPEX, leading to a preferential treatment of technologies that are relatively low in CAPEX and relatively high in OPEX. These "African" circumstances in particular include the variety of investment-related risks (country, regulatory, commercial, and market risks) that will be more pronounced in sub-Saharan Africa and other developing countries than in developed countries or emerging economies (see a more detailed elaboration on such risks further in the following section). Such risks will immediately increase the return expectations of investors and, with these, any project's cost of capital—which will tend to discourage capital-intensive energy options and encourage less capital-intensive options. Higher risks associated with the novelty of most non-hydro renewable energy technologies will also contribute to increased return expectations of investors—more so in developing countries than in mature markets, given the usually longer track record of renewable energy technologies in the latter. In addition, many countries in sub-Saharan Africa have at their disposal sufficiently large endowments of fossil fuels or access to cheap imports from neighboring countries, making the OPEX-related benefits of renewable energy more negligible (KfW 2005, 38).

Public subsidies for fossil-fuel-based generation—Public subsidies are a global problem that has been addressed by, among others, the G20 (the Group of Twenty comprises finance ministers and central bank governors of 19 countries and the European Union). The countries of sub-Saharan Africa are no exception to their effects, since such subsidies further deteriorate the competitiveness of renewable energy technologies that do not enjoy equally large public support. This support, totaling approximately US$500–$700 billion per year, for conventional energy (mostly fossil fuels) creates an uneven playing field for the adoption of renewable energy. By comparison, the IEA estimated government support for electricity from renewables and for biofuels at US$57 billion in 2009. Realigning these subsidies is the most obvious way to alter the market advantage in favor of sustainable energy production, as was recognized by the G20 in 2009 when it pledged to phase out "inefficient and wasteful" fossil-fuel subsidies (UNEP 2011). The World Bank and the International Energy Agency put global figures for such subsidies in the order of US$100–$200 billion per year. Such subsidies can take a wide range of forms: direct budgetary transfers, tax incentives, R&D spending, liability insurance, leases, land rights-of-way, waste disposal, and guarantees to mitigate project financing or fuel price risks (Beck and Martinot 2004, 365-383).

The un-priced externalities of carbon emissions—Renewable energy technologies can outperform conventional technologies, but only if the comparison is done on a total cost basis: when the environmental and social costs are included in the cost & benefit analysis. In many jurisdictions globally, putting a price on carbon is mainstreaming the internalization of such costs, be it through carbon taxes or the establishment of emissions trading schemes. For a variety of reasons, such measures are difficult to justify politically in developing countries, particularly those less advanced, given poverty eradication priorities coupled with the fact that resulting environmental externalities will be global while the costs to internalize them will be borne locally. A softer alternative approach consists in putting a price on carbon as an incentive only in the event of carbon reductions, as done through the Clean Development Mechanism (CDM) under the Kyoto Protocol, rather than as a sanction on existing or increasing emissions. Further detail on the extent to which the CDM has catalyzed renewable energy in a sub-Saharan Africa context is provided below. At this stage, no African country has put in place a price on carbon that would truly create a level playing field in terms of costs and benefits between conventional and renewable energy technologies.

Low returns with positive cash flows coming first in the long run—"In principle, the profile of long-time exposure calls for compensation in the form of higher interest rates and returns on equity. The possibility for that is limited by the low project returns, which make such kind of projects rather unattractive" (KfW 2005). Investors, sponsors and finance providers can view this characteristic of renewable energy projects as a form of risk intensifier. Given the generally riskier circumstances in sub-Saharan Africa, this feature of renewable energy projects becomes much more burdensome there than in other, less risky geographies of the world.

High transaction costs—The relatively high transaction costs of renewable energy technologies as well as some of the unique aspects of those technologies or projects tend to be exacerbated by the local circumstances of, in particular, sub-Saharan Africa countries:

- Renewable energy projects are typically smaller than conventional energy projects, a fact that automatically increases transaction costs, which tend to be fixed. The transaction costs per kilowatt (kW) for a central coal plant, for instance, are lower than the sum of the costs of the many thousands of transactions required for comparable capacity from solar home systems, for instance. Faced with the choice, investors are wary of the latter (UN Technical Cooperation 2011). In sub-Saharan Africa, many, if not most, opportunities for the development of renewable energy present themselves in the form of small-scale projects.

- Projects may require additional information not readily available, including historic weather-related data such as the wind, solar radiation, and precipitation records. While such data are often readily available in developed countries, there is a large gap in the availability of this data in developing countries, particularly in those of sub-Saharan Africa.

- Renewable energy projects may often require additional time for or attention to financing or permitting because of unfamiliarity with the technologies or uncertainties over performance. For these reasons, the transaction costs of renewable energy projects—including assessing resources, siting, permitting, planning, developing project proposals, assembling financing packages, and negotiating power-purchase contracts with utilities—may be much larger on a per-kilowatt capacity basis than for conventional power plants. However, in practice some transaction costs may be unnecessarily high, for example, overly burdensome utility interconnection requirements and high utility fees for engineering reviews and inspections.

Part 4: The Structure and Design of the Local Energy Sector

The lack of renewable energy capacity, or the environmentally unsustainable nature of electricity generation, is only one of many challenges that the local energy sector in many developing countries, including most of sub-Saharan Africa, is currently confronted with. The need to shift from carbon-intensive and other relatively unsustainable energy alternatives to low-carbon and sustainable options, is a relatively new challenge, and needs to be viewed within the context of the broader history of the energy sector as well as alongside current developments and efforts to respond to other, more immediate challenges.

In developing countries, these more immediate, fundamental challenges include: the limited scope and coverage of energy infrastructure in terms of both geographic area and users; a large gap in generating capacity; obsolete employed technologies and the poor state of the overall energy infrastructure; the low levels of resource efficiency that lead to high costs per output unit, which—given low affordability levels among local populations—are often kept down through subsidies from already constrained public budgets; the manipulation of electricity prices for political reasons; the low levels of electricity penetration in the local population; and so on (Bacon 1995, 119-143; World Energy Council 1998, 121; Paterson 1999, 203; International Energy Agency 1999, 106). The fundamental problem can most often be traced back to the overall inefficiency as well

as the run-down and unsustainable finances of government-owned utilities and the resulting lack of much needed investment, be it for expansion or refurbishment. The typical approach to solve what appears to be a vicious circle has been a reform process comprising elements of decentralization (either horizontally, vertically, or both) and privatization. This approach was motivated especially by expectations of enhanced efficiency, both in terms of resources and overall management; capital investment into technologies and infrastructure; and increased competition in an energy market. Jointly, these were expected to create more innovation, wider coverage, better service, lower

prices, and more sustainable public finances. Such energy reform typically involves several components, particularly (i) the introduction of competition in order to improve sector performance in terms of efficiency, customer responsiveness, innovation, and viability; (ii) the restructuring of the electric power supply chain to enable the introduction of competition, through the unbundling of vertically or horizontally integrated companies; (iii) the privatization of the unbundled electricity generators and distributors under dispersed ownership; and (iv) the development of economic regulation of the power market that is applied transparently by an agency that operates independently of influence by government, electricity suppliers, or consumers (Bacon and Besant-Jones 2002, 2).

The Need for Grid- and Energy-Market Access

Whether or not energy sector reform—along the lines set out above—will lead to the expected results is not the subject of this article. But it appears that such reform can have fundamental implications on the uptake and development of renewable energy. In many developing countries, the conventional market structure is one dominated by a state-owned national power utility with a legally endowed monopoly and a vertically integrated supply chain encompassing power generation, transmission, distribution, and customer services (Bacon and Besant-Jones 2002)—a system that by default lacks the flexibility to provide easy grid- and market-access, on fair terms, to third-party and/or private-sector power producers.

A critical point here is that such private sector electricity companies and independent power producers (IPPs) are the ones readily equipped with the ability and expertise to rapidly mobilize investment, and therefore such private sector capability must be fully encouraged and utilized. However, it must be remembered that IPPs and private sector companies have the expertise, capacity, and skills not only to install and operate new energy infrastructure in the specific context of renewable energy technologies, but also in fossil-fuel-based or other areas of conventional electricity generation. What this means is

that while broader energy sector reform can be conducive—or may even be a key requirement—for the rapid uptake of renewable energy, if it is not complemented with a set of dedicated renewable energy policies and incentives, it can actually turn out to be counter-productive. This is shown precisely by evidence from sub-Saharan Africa, where energy sector reform and up-scaled IPP initiatives led to increased fossil-fuel-based rather than renewable energy generation (UNESCA & UNEP 2007), resulting in increased overall need for fossil fuel imports, and negative implications for the balance of the overall energy mix. Companies that illustrate the potential of IPPs in renewable energy deployment include Ormat Inc., which operates a 100 MW geothermal plant in Kenya, and Compagnie Thermique de Belle Vue Limitee, which operates a 70 MW cogeneration plant in Mauritius. The geothermal plant in Kenya incorporates a high-tech air-cooling and re-injection system of all geothermal fluid, thereby avoiding an estimated 200,000 tons of CO^2 emissions per year (ibid).

Increasing grid- and market-accessibility for the private sector therefore can be a double-edged sword. The fundamental reason for this, as mentioned above, is the continued financial inferiority of renewable energy relative to conventional technologies, within a policy vacuum. As investors, IPPs will be guided first and foremost by the risk-return profile of investments, and given the lower overall cost structure of fossil-fuel projects in the short term and the particularities of the sub-Saharan Africa risk landscape, conventional technologies have scored and will continue to score better in terms of risk-return. A purely financial assessment of risk and return by private sector actors will typically not consider long-term and broader costs and benefits of renewable energy, such as: the need for a strategic orientation of the national electricity mix in light of resource scarcities; the financial competitiveness of renewable energies in the long term given the more favorable OPEX profiles; and the environmental and social benefits given their carbon-efficiency and the fact that renewable energy systems can be developed in a modularized and off-grid manner that is more appropriate for rural areas.

Public Intervention for a Level Playing Field

A wide variety of policy instruments and incentive mechanisms can be deployed with the objective of leveling the playing field for renewable energy technologies. The question of which specific combination of these will lead to the most effective and most cost-efficient results is subject to the local socio-economic circumstances, and the availability of naturally endowed renewable energy and the best-suited technologies, as well as the national goals for renewable energy expansion. Four main categories are within the scope of public incentives for renewable energy (UN-Energy/Africa 2011, 27) (Table 1).

Table 1: Policy Instruments for Renewable Energy Development

1.	**National renewable energy targets**
	Design. Such targets are not necessarily a policy instrument, but rather the policy objective that is aimed for through the implementation of the instruments.
	Impact on the risk-return ratio of renewable energy projects. Targets are a critical component of any renewable energy package because they allow private sector actors to know "where the journey is going" and, therefore, increase the reliability and trustworthiness of any instruments put in place subsequently.
	Application in non-Annex B countries. More than 25 developing countries have put in place renewable energy targets, including 13 countries in Africa, of which 8 are countries from sub-Sahara Africa, other than the Republic of South Africa (REN21 2010).
2.	**Feed-In-Tariffs and other renewable energy production incentives**
	Design. These are favorable, obligated fixed-rate tariffs for generators to sell renewable energy (usually as electricity) to networks. The purchasing "suppliers" are therefore obligated to buy at the special tariff rate and are allowed to fund the extra cost from a relatively small levy on all their consumers.
	Impact on the risk-return ratio of renewable energy projects. Output-based incentive systems such as renewable energy production incentives as well as feed-in tariffs can considerably enhance the risk-return profile of sustainable energy projects. Providing an above-market price premium for renewable energy compensates for the cost disadvantages of clean energy sources enhancing the profits of projects and returns on investment. Feed-in tariffs as well as renewable energy production incentives are mostly offered at a predetermined height and over a predetermined number of years and provide medium- to long-term certainty on prices and revenues. Market risk is therefore entirely mitigated while prices for conventional energy remain volatile.
	Application in non-Annex B countries. Until early 2010, more than 30 jurisdictions in developing countries, either at the national or sub-national level, had put in place feed-in tariffs. In sub-Saharan Africa this has only been the case in Mauritius (1988), Uganda (2007), Kenya (2008), and Tanzania (2008).
3.	**Quotas such as Renewable Portfolio Standards (RPS) / Renewable Obligation Certificates (ROC)**
	Design. Require power generators and/or utilities to generate and/or supply a pre-determined proportion of electricity from clean energy sources. Such obligations, when combined with systems of tradable renewable energy credits or renewable obligation certificates, can reduce the macro-economic costs associated with expanding renewable energy capacity by enabling flexibility on where sustainable energy is generated and by whom (sustainable energy being generated where it is cheapest).

	Impact on the risk-return ratio of renewable energy projects. Quota schemes force utilities and power generators to install a certain amount of renewable energy capacity (or generate/sell a certain proportion of sustainable energy) or to compensate for a lack of such capacity with the purchase of credits or certificates. This means that: A fixed level of demand for renewable energy technologies and projects is upheld, thus enabling scale as well as a less risky market, in addition to revenues based on electricity sales. Renewable energy projects can earn revenues based on the sales of such credits and certificates, adding an additional layer of return for a given level of risk to the financial profile of such projects.
	Application in non-Annex B countries. Until early 2010, only 9 jurisdictions in developing countries had put in place quota-based policies for renewable energy development, most of them in a number of Indian states. No such policy had been put in place in sub-Saharan Africa.
4.	**A price on carbon driving the internalization of the environmental costs of GHG emissions**
	Design. A price on the right to pollute the atmosphere with greenhouse gases can be put in place through a carbon tax or through an emissions trading scheme.
	Impact on the risk-return ratio of renewable energy projects. By forcing the internalization of environmental costs, a meaningful carbon price creates a level playing field between renewable and conventional energy options. The risk-adjusted investment returns of the former increase relative to those of the latter as a carbon price entails costs only for conventional technologies, not, however for zero- and low-carbon technologies. Under a cap-and-trade system or an international crediting mechanism, a price on carbon can open new revenue streams for sustainable energy projects.
	Application in non-Annex B countries. At present, only a few jurisdictions feature a price on carbon. Not one developing country, and no country in Africa, provides for a price on carbon. More than 4,200 CDM projects that are expected to generate 2.9 billion CERs by 2012 are in the global pipeline. However, the current distribution of projects is uneven, with 75% percent of registered projects located in Asia Pacific and less than 1% in sub-Saharan Africa.

Source: UNEP FI.

What appears to have led to success in the deployment of existing renewable energy technologies and the installation of renewable energy generating capacity in numerous countries worldwide—and what many countries in sub-Saharan Africa appear to lack—are two fundamental conditions:

Easy market access—The regulatory framework for the electricity sector needs to provide easy grid- and market-access, on fair terms, to private sector entities and independent power producers (IPPs). This condition can be fulfilled even in the case of a monopolistic energy sector where IPPs rely on power purchase agreements (PPAs). However, it is suggested that, by definition, the likelihood and reliability of easy market access—and ultimately energy investment—will be higher in the case of a decentralized and liberalized energy sector.

A level playing field—Market access alone will not be enough; it needs to be complemented by policies that enhance the short-term financial competitiveness of renewable energy relative to conventional options. Given the difficulties and limited support provided by international carbon markets, domestic incentives are essential. The mere existence of incentives, however, is also not enough; private sector actors must trust the reliability of the schemes in the medium to long term (see the low-carbon policy risk category discussed in Part 5).

To date, most countries in sub-Saharan Africa seem to have fallen short of making progress on these two fundamental conditions:

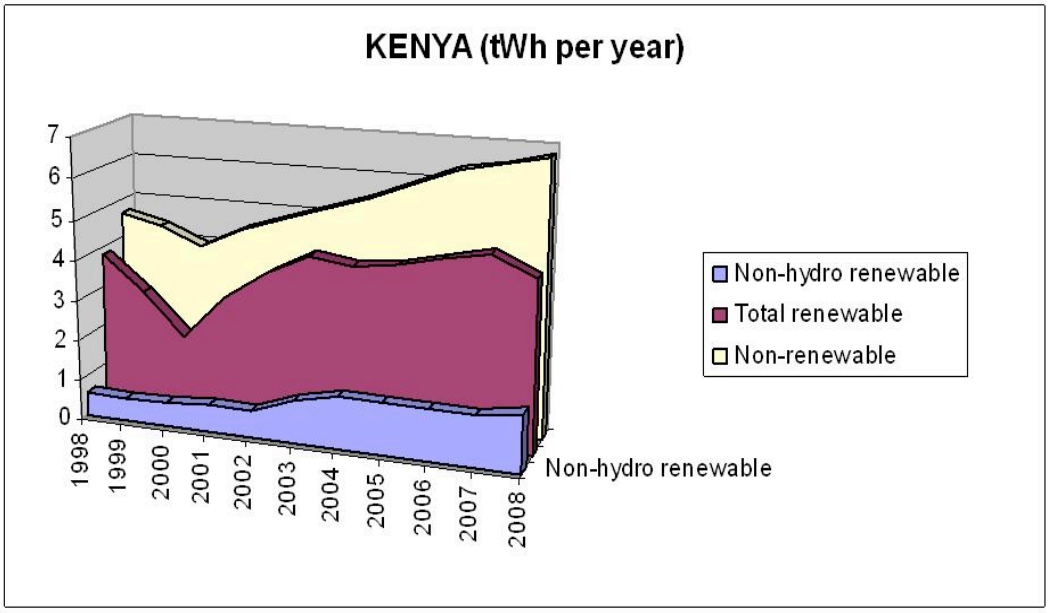
1. When compared with reform processes worldwide, sub-Saharan Africa has been the slowest to implement power sector reforms towards higher degrees of liberalization and decentralization. This observation is supported by the United Nations Environment Programme (UNEP) and the Economic Commission for Africa (UNESCA and UNEP 2007), and is according to the latest and most comprehensive global survey of the status of power sector reforms in developing countries (Bacon and Besant-Jones 2002). The survey included 48 sub-Saharan African countries and revealed that, in contrast to other regions in the developing world, overall sub-Saharan Africa's power sector was the least reformed (UNESCA and UNEP 2007). Where reforms have led to the establishment of IPPs, they have tended to favor large and centralized systems in either hydroelectric or fossil-fuel-based generation. Most reform efforts in the sub-Saharan energy sector have primarily focused on partial privatization, most often in the form of commercialization, implemented through management contracts or tariff reform, and only secondarily on liberalization, decentralization and increased competition. It is, however, these latter reform components that can ultimately enhance energy market access to IPPs.

2. Many sub-Saharan countries have put in place national targets for the expansion of renewable energy and have acknowledged the importance of renewable energy in national development and poverty reduction plans (see Table 1). Despite such support and endorsement at the political level, however, the same countries have to date failed to put in place the supportive policies needed to create the level playing field. Without these policies and incentives, as we have seen, and even with a conducive sector reform in place, investors and IPPs will continue to place emphasis on conventional energy options. It is interesting to note that those sub-Saharan countries that appear to lead the way in the expansion of renewable energy are those that have put in place concrete measures that go beyond political statements. Notably, these countries include Kenya, Uganda, and Mauritius, as well as a few others.

Kenya

Kenya is the undisputed leader of sub-Saharan Africa in the generation of electricity from renewable sources, particularly non-hydro (see Figure 3). This is mostly due to the large-scale exploitation of geothermal energy in the Rift Valley, which started as early as the 1980s. Kenya is one of only a very few countries in sub-Saharan African to have put in place a system of feed-in-tariffs (which they did in 2008) that cover geothermal, wind, biogas, and small-scale hydro generation. Kenya has also reformed its energy sector to

Figure 3: Electricity Generation in Kenya (1998–2008)



Source: Remco Fischer, UNEP Finance Initiative.

allow for easier access and competition among independent electricity generators under a single-public-buyer scheme. Given that the feed-in-tariff scheme was introduced only in 2008, however, it appears that Kenya's earlier positive developments may be explained by the mere availability of vast geothermal resources rather than by the development of renewable energy support policies at the national level. However, current trends in the Kenyan pipeline of renewable energy projects under the Clean Development Mechanism (CDM) appear to indicate that since 2008 renewable energy activity has accelerated: at present, almost one third of all renewable energy CDM projects in sub-Saharan Africa (excluding South Africa) are located in Kenya, including the notable 310 MW wind project at Lake Turkana. In 2008, overall installed capacity in Kenya reached 750 MW for hydro-based energy generation and 115 MW for other renewable energy generation. In 2011, however, there were roughly 575 MW of renewable energy projects in the CDM pipeline, albeit with only 85 MW having achieved registration under the CDM Executive Board.

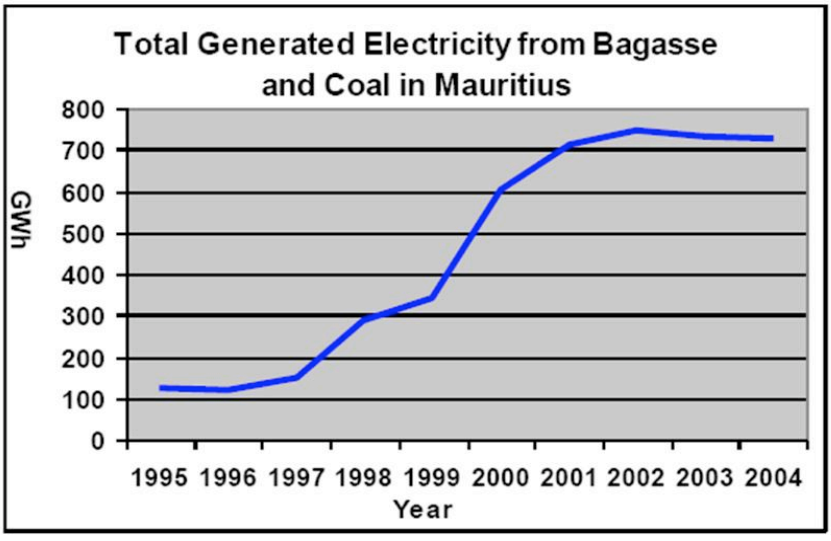
Uganda

Uganda scores highly both in terms of its renewable energy capacity in the current CDM pipeline as well as in the comparably advanced state of its dedicated renewable energy policy. The latter has been praised for its sophistication and in consideration of the lessons learned from experiences abroad—covering tariffs for wind, solar PV, biomass, biogas, landfill gas—by differentiating wisely between size categories of hydro-power generation, and providing both yearly and cumulative caps on each technology. Together with the development of an effective institutional infrastructure for management of the CDM (UNEP FI 2011), the scheme seems to only quite recently considerable spurt in renewable energy activity. In 2008 Uganda had 550 MW of total installed capacity, of which 315 MW were hydro-based. In 2010 there were 300 MW of renewable energy in the CDM pipeline, comprising new terrain for Uganda in the area of biomass, including the controversial Bujagali dam project of 250 MW, and only 17 MW worth of registered projects.

Mauritius

The Mauritian experience in co-generation is one of the success stories in the energy sector in Africa: Since 2002, biomass-based electricity co-generation from sugar estates (over half of it from bagasse) has stood at 40% of the total electricity demand in country (AFREPREN 2011). Mauritius has, over a period of nearly two decades, developed a feed-in pricing policy on co-generated power, which has been the key driver for increased production of bagasse co-generated power (AFREPREN/FWD 2009) (Figure 4).

Figure 4: Total Electricity Generated from Bagasse and Coal in Mauritius



Source: Quelle: MSIRI, 2006; AFREPREN/FWD and E-Parliament, 2009.

Additional Renewable Energy Projects in Sub-Saharan Africa Countries

All countries in sub-Saharan Africa that have developed at least nascent industries in renewable energy generation and distribution have achieved this through supportive policies and the provision of grid-access to IPPs.

Tanzania, which currently carries 18 MW of new capacity in its CDM portfolio, offers a feed-in tariff to hydroelectricity generators, and grid-access to IPPs through long-term PPAs with the vertically integrated public monopolist. Cape Verde, which has recently seen wind generation development in the order of 30 MW, had previously put in place an ambitious plan for wind energy development and regulation that allows the import of renewable energy equipment, such as solar panels and wind generators, with tax exemptions (REEEP 2010). Nigeria, Senegal, Mali, and Ivory Coast have established some very modest regulatory support, mostly of a fiscal nature, for renewable energy generation, and made IPP generation possible through different grid-access models.

In the rest of sub-Saharan Africa, while targets may have been put in place in some countries, the lack of concrete regulatory support has meant a lack of grid-based renewable energy infrastructure development. Such a gap has only marginally been closed by the CDM.

Part 5: Investment Risks in Renewable Energy

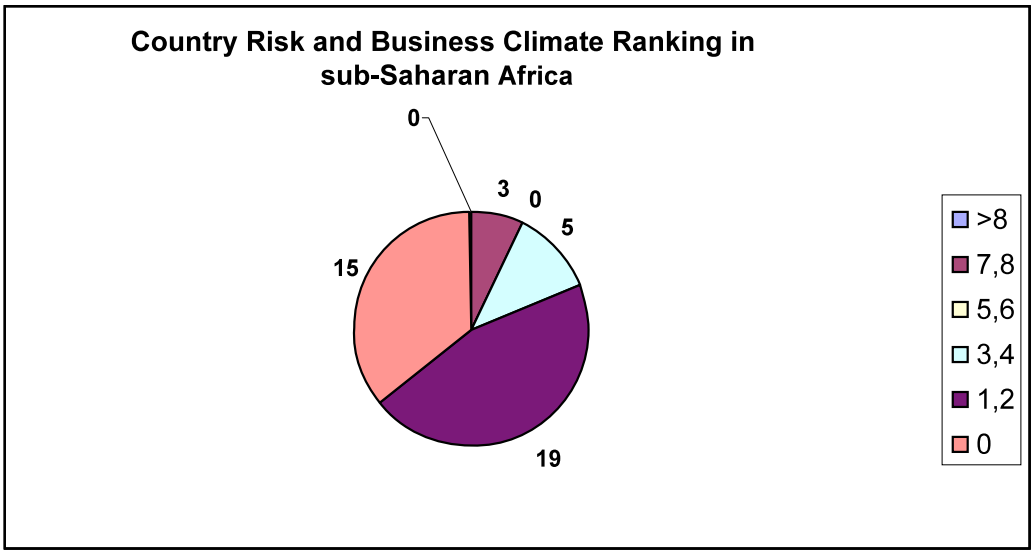
In addition to the lack of a level playing field other obstacles limit the development of renewable energy technologies. The accumulation of various significant investment risks makes it difficult to invest in a developing country context. First, the general risk associated with the novelty of renewable energy technologies is particularly pronounced in developing countries that lack the track record, overall business infrastructure, and professional expertise in these technologies. Second, this risk is exacerbated by investment risks that are typical for developing countries, including political, refinancing, and commercial risks introduced by the poor creditworthiness of state-owned utilities that have payment obligations to buy generated power under PPAs (African Development Bank 2010). The poor creditworthiness is often explained by poor billing and payment collection systems, limited innovation, and prices that reflect neither costs nor demand, but are determined on political grounds. The accumulation of these risks increases the return expectations of potential developers and their financial backers to prohibitive levels, which are particularly detrimental to renewable energy technology given its capital-intensive nature, as previously discussed.

According to the United Nations Environment Programme (UNEP and Partners 2009) the main nontechnology risk categories that characterize the environment for investments in developing countries, including those in sub-Saharan Africa, are country and political, low-carbon policy, and currency.

Country and political risk

The country and political risk category encompasses risk of expropriation, breach of contract, war, and civil disturbance. As vague and all-comprising this category of risk may be, it is critical: for foreign investors and financial institutions, it will often act as an early selection filter in many financial decision-making processes, and does very often hinder, on the basis of broader macroeconomic, political, or legal concerns, the implementation of otherwise promising and high-potential projects on the ground (Baldwin 2006, 35-38). An indication of how countries in sub-Saharan Africa currently perform with respect to "country risk" and "business climate," is calculated on a scale of from 0 to 12 and is based on a composite indicator that combines the country ratings (Figure 5). The bulk of the analyzed countries (34) find themselves in the two lowest possible categories; while five countries—Cape Verde, Senegal, Gabon, Benin, and Lesotho—make it to the third worst category (out of 6 categories). Only three countries—Botswana, Mauritius, and Namibia—make it into the second highest category. The Multilateral Investment Guarantee Association (MIGA) or export credit insurance agency, a member of the World Bank group, insures against such risk for a fee. However, the availability of such insurance is limited only to foreign investors, financiers, or exporters.

Figure 5: Distribution of Countries in Sub-Saharan Africa According to Country Risk and Business Climate Ratings

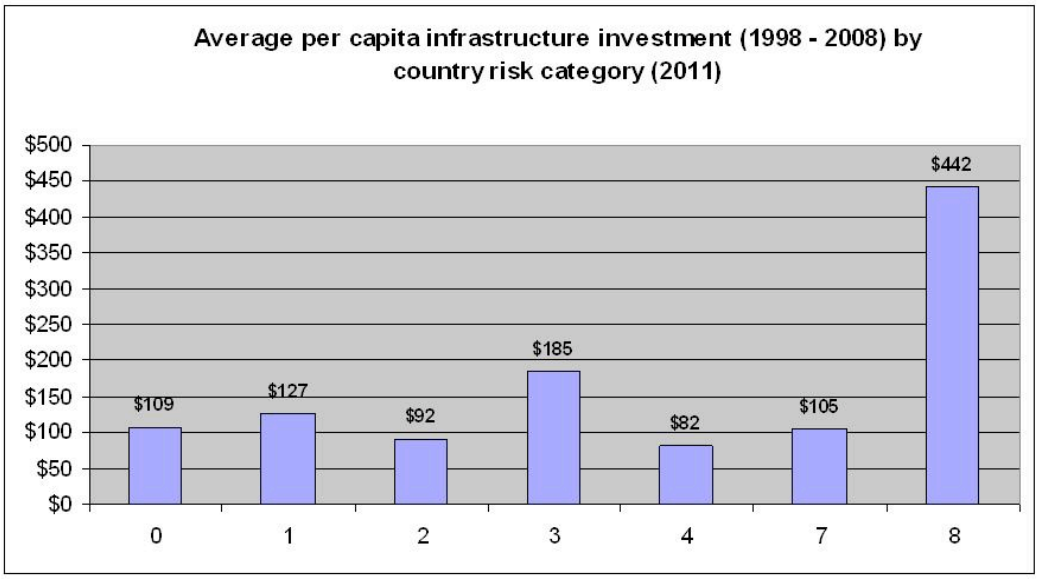


Source: Remco Fischer, UNEP Finance Initiative.

Several studies point to the close links between country risk and related aspects of public governance (including quality of administration, public accountability, and political stability) to levels of private investment, and especially, but not only, foreign direct investment (Ramcharran 1999, 49-59; Aysan and Ersoy 2007, 1-16). This rationale also appears to apply in a specific sub-Saharan Africa context: the total average per capita infrastructure investment with private participation (1998–2008) by country risk category (as measured by the above composite indicator) (Figure 6). When compared, as a whole, with all other macro-regions of the world, sub-Saharan Africa is the most risky (Ferrari and Rolfini 2008, 6).

Furthermore, political risk in sub-Saharan Africa, more than in any other part of the world, is seen to be not only rooted in the potential behavior of governments and other official actors, but in that of any organization or individual with political aims. Even relatively advanced states such as Uganda cannot always claim control of their entire sovereign territory (Baldwin 2006). In such vacuums of public authority, competing investors, NGOs, militia groups, individual politicians, or specific arms of a government—all are potential threats to investment.

Figure 6: Total Average per Capita Infrastructure Investment with Private Participation (1998–2008) by Country Risk Category



Source: Remco Fischer, UNEP Finance Initiative.

Low-Carbon Policy Risk

Low-carbon policy risk pertains to the possibility that policies underpinning investments in renewable energy projects (such as the policies and mechanisms outlined above) might

be reversed. In addition to operating in an overall difficult and risky political, legal, and macro-economic context, renewable energy technologies in developing countries are also exposed to more specific regulatory risks given their financial inferiority and the resulting reliance on public support mechanisms and incentives. If such concrete incentives are discontinued or, even worse, altered or reversed retroactively, renewable energy projects suddenly become unviable. Low-carbon policy risk is essentially the component under regulatory risk that applies specifically to renewable energy projects and other decarburization efforts; it relates to the question of how credible and reliable public policies, regulation, and incentives are over the appropriate timeframes, and how effectively they are implemented by government agencies (Helm and Hepburn 2003, 438–450).

Such risks have materialized also in developed country regions such as Europe, where the German, Spanish, and Czech feed-in tariff levels were suddenly corrected, at times entirely discontinued, or reversed retroactively. The reason for these corrections was partly the over-generous design of the feed-tariffs in the first place, which allowed investors to seize overly high and unjustified returns (Konttinen 2010). In the Czech Republic, a tax of 28% on solar photovoltaic revenues was introduced in 2010, with a retroactive effect, leading to a loss of investor confidence and trust in ongoing national regulation and promotion of renewable energy technologies (Renewable Energy Focus 2010).

Given the political instability, frequent lack of law enforcement or implementation of regulation in many developing countries, even if supportive policies for renewable energies are put in place, private initiative and investment will only materialize if the continuity of such policies is ensured, including through so-called grandfathering clauses. Such clauses can prevent the discontinuation of policies when there are changes in the public administration, for instance after elections. Establishing regulatory agencies that are independent, to a certain degree, from central governments and thus less exposed to political tactics can also contribute to the continuity and stability of regulation (Kirkpatrick and Parker 2005).

Currency (Foreign Exchange) Risk

Currency risk is a trivial but critical risk class, particularly in the least developed countries with volatile currencies and weak financial markets, which makes capital investments, particularly those related to infrastructure, reliant on foreign financing. Currency risks are especially pertinent for projects delivering a public good to local populations, such as electricity or water, given that project cash flows are mostly denominated in local currency while debt service or dividend payments are expected in hard currency. In

addition, there is a lack of commercial markets for currency risk hedging instruments for "small" currencies that are not traded much internationally. This gap has been partly closed by the Currency Exchange Fund, which has a mandate of international development cooperation and is partly capitalized by public European actors. It offers those investing in developing markets the opportunity to hedge their local currency risk with swap products. But not even this noncommercial instrument with developed country donor backing covers all countries of sub-Saharan Africa; it excludes Liberia, Malawi, Sierra Leone, Sudan, Democratic Republic of Congo, Eritrea, and Somalia.

Given their novelty and short track record, renewable energy technologies are particularly and strongly affected by foreign exchange risk, especially in countries with volatile currencies. This circumstance also contributes to a lack of technology know-how among local financial institutions and a heavier reliance on foreign finance for renewable energy than for conventional technologies.

Conclusion

Africa's need for energy—together with its considerable and untapped resources in renewable energy—point to where the continent should be headed in developing its energy sector and infrastructure. The rapid expansion of renewable energy capacity in sub-Saharan Africa contains the potential to address several problems and seize opportunity at the same time by (i) quickly increasing electricity penetration, including to remote communities distant from current grid infrastructure; (ii) reducing the current reliance on expensive fossil fuel imports, as well as—in the case of countries that rely heavily on hydropower—exposure to the considerable risk of drought; and (iii) increasing clean private investment, including from abroad, by tapping into international carbon markets.

While renewable energy options remain, at least in the short term, more expensive than conventional options, proven avenues and promising steps can already be taken so that developing countries are able to profit from the long-term benefits of renewable energy generation. Supportive incentives at the local level can be powerful levers of private investment when carefully combined with energy sector reform, but they have to be concrete and go beyond high-level statements of political correctness. Furthermore, public support must be reliable in the medium to long term, which is challenging given the bad standing of many governments in areas such as public accountability and political stability. These types of local constraints can be bridged, however, with international support. Country risk instruments, deployed internationally, already play a significant role in enabling private investment in risky countries, and the international carbon markets can push return expectations to levels that justify higher levels of risk.

Ultimately, serious public commitment is needed at the local level. In addition, local and international communities need to cultivate an understanding of how private investment works and how to effectively promote and mobilize it through smart public intervention—not for short- but for long-term benefit.

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A Commentary on *Barriers and Drivers to Renewable Energy Investment in Sub-Saharan Africa*

Maya Forstater

Renewable energy offers Africa the potential to replace expensive, dirty, dangerous, and environmentally destructive fuels such as wood, charcoal, diesel, and kerosene with clean, decentralized electricity.

Africa has an abundance of renewable energy resources, and has huge unmet energy demand. The technologies for renewables are increasingly proving effective and are coming down in price. Why then is Africa not leapfrogging to renewable energy systems, despite so many targets and high-level statements in recognition of the opportunity?

Fischer, Lopez, and Suh from the United Nations Environment Programme Finance Initiative (UNEP FI) Climate Change Team, in their paper on "Barriers and Drivers to Renewable Energy Investment in Sub-Saharan Africa," diagnose the problem (unsurprisingly) as a matter of finance: specifically, as the mismatch between risks and returns for investors contemplating renewables projects in Africa.

As they point out, renewable energy projects are more capital intensive than nonrenewables. Investments are riskier because of the relative immaturity of the industry and its dependence on specific policy interventions for a kick-start. Furthermore, concern about the stability and reliability of public policy implementation, regulation, and enforcement make investments in Africa riskier still. This triple whammy means that there is an investment gap for energy in Africa, and an even wider investment gap for green energy in Africa.

The authors conclude that ultimately "serious public commitment is needed at the local level" and that local and international communities need to understand how private investment works in order to develop smart public interventions to mobilize it.

To say that *more political will is needed,* however, is not so much an answer as the start of another question: How?

The authors touch briefly on the political economy dimensions of why it has so far been impossible to get the policy measures needed to attract investment to the industry in Africa, despite countless high-level declarations. For example, they note that proposals to introduce carbon taxes run up against objections for undermining economic competitiveness, energy access, and poverty reduction.

In fact, each of the four potential smart polices that the paper catalogues—national targets, feed-in-tariffs, renewable portfolio standards and carbon prices—will, if effective, result in more of a country's electricity supply being drawn from clean-but-relatively-expensive sources in preference to dirty-but-cheaper sources. Unless there is public (international or national) funding, the incremental costs will be passed on to local consumers and industry.

As the UNEP FI paper notes, it is wise for policy makers to understand how private investment works in order to develop smart interventions. However, it is also crucial to understand the political barriers and drivers, so as to identify which public policies will work in practice.

While both investors and governments increasingly recognize in principle that it makes long-term sense to build up a renewables industry rather than to lock-in to dirty power supplies, in practice the incentives are leading both in the opposite direction. This is not a problem unique to Africa.

Just as investors will put their capital up only if they view the risk as justified by the returns within their decision-making horizon, government ministers and officials have their own hurdle rate for supporting policy measures. The calculation involves "gain-minus-pain" discounted over the make-or-break horizon of their careers. At best, this is measured against their particular ministerial priorities, and at worst, against their own personal enrichment.

Furthermore, potential costs and benefits are not evenly weighted since constituencies with the most to lose are able to mobilize political pressure more effectively than those who would benefit from change. Existing industries with large workforces have stronger lobbies than the industries of tomorrow whose workforces are not yet recruited. Meanwhile rural women and children, who spend hours a day collecting firewood and suffer the health effects of smoke-filled homes, barely register on the political agenda.

The policy interventions needed for renewable energy projects to thrive do not fit neatly into the way that public institutions, designed for the carbon age, are organized. Energy policy reforms, incentive measures, public investments, and capacity building are spread across national planning, finance, energy, industry, and environment ministries, and are linked to decisions by local planning authorities, education authorities, state-owned energy companies, and regulators. Each institution has its own gain-minus-pain calculation and specific priorities —be they keeping public costs down, keeping the lights on, maintaining jobs, creating new ones, or by doing the institution's national bit to stabilize greenhouse gases.

The UNEP FI paper describes one part of a vicious circle. Lack of political support means that policy measures and reforms are not carried out with conviction, and investors therefore apply a risk premium, which prevents large-scale investment from flowing to renewables.

The other side of the loop is that, in this environment, renewables investment will at best offer only ad-hoc development of turnkey facilities, resulting in little increase in local employment or skills development. Such an outcome provides no basis upon which to build a critical mass of support amongst those who must champion effective policy implementation and challenge vested interests in this new and complex area.

Such vicious circles are not helped by being embedded in a dysfunctional international discussion about funding for mitigation and adaptation in which the balance between domestic costs, international support, and private sector risk appetite is often seen as a zero-sum game. Smart national policies and smart international mechanisms are needed to break the vicious cycle and overcome the two linked deficits—of willing investors and political will.

As the paper's authors point out, smart policies must be *cost efficient* and *effective*, but the political economy discussion highlights two further crucial criteria—they must be *implementable* and they must *deliver local benefits*. The smartest policy may not be the one that delivers carbon mitigation at least cost on paper, but the one that can actually be put into practice by the people who have a stake in the country's development. This means policies that enable African countries to use their domestic demand and natural resources as a springboard for industrial development in this latest industrial revolution.

One country, outside the paper's scope but with regional significance, that is seeking to develop such a smart mechanism is the Government of South Africa, through it's South African Renewables Initiative (SARi).[*]

Through SARi, the South African government is seeking to develop a financial mechanism that would enable the country to procure renewables at a scale whereby national benefits would be significant. The financial mechanism being developed blends international climate grants, low cost loans and risk mitigation products, and a program of national public policy reforms as part of an international partnership.

While the financial mechanism itself seeks to improve the risk-return rate by overcoming the barriers well described in the UNEPFI paper, it is embedded in an approach to

[*] For more information, see www.sari.org.za. Note: I am part of the team supporting the South African Government in developing this initiative.

addressing the linked set of political economy obstacles. The aim is not to optimize the policy for least-cost greenhouse gas mitigation, but to catalyze green growth.

Such an approach draws, in the first instance, on funding from developed countries that have committed to funding climate change mitigation ("Annex 1" countries in the climate change jargon). However, other potential sources of patient finance are also interested in developing the next generation of infrastructure in Africa, in particular from China. Chinese companies have only just begun to invest in renewables development and manufacturing in Africa (aside from hydro); however, the model used for other infrastructure investments, which draws on low-cost loans from the Export-Import Bank of China and development banks and a lower cost structure than that of multinationals from mature markets, could well be transferred to this sector. China's government is encouraging its companies to pursue renewables in Africa through the China-Africa Development Fund (CADFund) and has said that its main priority sectors in Africa include renewable energy.

Renewable energy could bring economic as well as climate benefits in Africa. But dependence on external capital flows, whether from western development finance institutions and financial markets, or from new emerging market powerhouses, makes it harder to develop a coherent approach based on domestic industrial policy objectives. The danger is that, as with previous generations of externally invested infrastructure development in Africa, the political will to make it happen could be found by mobilizing a small group of rent-seekers, rather than a wider population that would benefit from industrial development. In this case, even if the risk-return prospects are made more attractive for investors, Africa may end up being a subsidized market for renewables technology exports rather than a competitive place for their production.

Fischer, Lopez, and Suh's analysis of the financial barriers and drivers determining whether individual projects will be viable is a useful contribution toward developing smart policy. But it also needs to be joined with analysis of the balance of economic costs and benefits that would make development of an industrial policy for renewables politically viable.

Biography

Maya Forstater has worked for over fifteen years in the field of sustainability and the role of the private sector, investors, and public policy makers in transforming production and consumption systems toward sustainability. Her work includes leading research and

advising organizations in developing strategic responses to issues ranging from climate change to supply chain labor standards.

Maya has worked with major corporations, multi-sector partnerships, and business groupings in the energy, ICT, apparel, mining and minerals, and mobility sectors, and has written extensively on a range of issues related to sustainability and the private sector. She is currently involved as part of the international team supporting the South African Government to develop the South African Renewables Initiative.

Among the numerous publications she has authored and contributed to are "Low Carbon Growth Plans: Advancing Good Practice" (Project Catalyst); *Unlocking South Africa's Green Growth Potential* (SARi/DTI); "Responsible Business in Africa: Chinese Business Leaders' Perspectives (Harvard); *Mobility for Development* (WBCSD); *The Practitioner's Handbook on Stakeholder Engagement* (UNEP/AccountAbility)*; The Materiality Report* (AccountAbility); *Corporate Responsibility: Implications for Small and Medium Enterprises in Developing Countries* (UNIDO); and *Business and Poverty: Bridging the Gap* (IBLF) . She can be reached at www.hiyamaya.wordpress.com or through Twitter as @MForstater.

Interview with Scott Henneberry

Conducted by Lia Abady, *JEI* Interview Editor
July 2010

When Hu Jintao, China's president, visited France last year, he saw just one company's factory: Schneider Electric. Scott Henneberry, VP of Smart Grid Strategy at Schneider Electric, speaks to Lia Abady for the Journal of Environmental Investing. In the interview, Mr. Henneberry talks about the importance of energy deregulation and the need for more collaboration between policy makers, municipal governments, and big utility companies. He also highlights the smart grid investment opportunities for asset owners.

Interview:

Ms. ABADY: *Thanks for taking the time to talk to the JEI. I'd like to begin with a rudimentary question: Is the smart grid a "thing for the future"?*

Mr. HENNEBERRY: In the electricity transmission and distribution industry, there are many people who are put off by the notion of the smart grid being a "thing for the future." They would respond by saying that grids might get smarter but they've actually been smart for some time. I'll give you a couple of useful perspectives. One perspective is that in terms of pure automation on the grid, we consider the transmission grid as separate from the distribution grid. The transmission grid has in fact been automated for some time and it's had to be automated given its huge complexity. What we are seeing now is a growing level of automation on the distribution grid. As part of the smart grid, the automation is now happening at both the transmission and the distribution level. This is possible not only because it's necessary, but critically, it's now much more affordable given the low cost of micro processors, chips, sensors, and software that are available on the distribution side with an added return on investment (ROI) where there wouldn't have been one in the past. The other perspective is the level of debate around whether the smart(er) grid is a good and worthwhile investment. I think that's an irrelevant question because clearly changes are happening that will increasingly mandate a smart grid and we will have no choice but to have a highly optimized grid in place. For example, the growth in renewable energy generation and the growth in electric vehicle ownership will demand

the automation of highly efficient distribution grids by distribution operators. It will be impossible to manage the distribution of energy in the same way as in the past with the increasing diversity in energy supply and demand. Instead of having a one-way power flow, which is quite easy to manage passively, we will have power flow coming from various sources and it will have to be actively managed. So the smart grid's happening and it's here to stay. The question is, can we develop it intelligently? Can we make sure the right applications are deployed? Can we balance supply and demand in an optimal fashion?

Ms. ABADY: *There seems to be a clear need for grids to get smarter. Can you please explain to us what necessary regulatory changes are required and can you please give us examples of enabling and disabling regulatory environments.*

Mr. HENNEBERRY: A smarter grid does require new business models and it does require a new view to regulation. There is no question that the challenges around the smart grid are to some degree technical but, by and large, we understand the technologies that need to be implemented. The regulatory and commercial challenges are far greater. On the technological side, for example, there is a need for greater demand response designed into the grid system and more sophisticated business models to create the right incentives for customers. Demand response is generally used to refer to mechanisms that encourage consumers to reduce energy demand, thereby reducing the overall peak demand for electricity at any one time. There are two types of demand response—emergency demand response and economic demand response. Emergency demand response is primarily needed to avoid outages. Economic demand response is used to help utilities manage daily system peaks. Smart grid applications improve the ability of electricity producers and consumers to communicate with one another and make decisions about how and when to produce and consume kilowatt-hours (kWh). Emerging technology will allow customers to shift from an event-based demand response wherein the utility requests the shedding of load, toward a more 24/7 based demand response where the customer sees incentives for controlling load all the time.

In the U.S., we have a very good example of a regulatory implementation for demand response. In 2005 the Energy Policy Act mandated the Secretary of Energy to submit to the U.S. Congress a report that identifies and quantifies the national benefits of demand response and makes a recommendation on achieving specific levels of such benefits by January 2007. The report estimated that in 2004 potential demand response capability equaled about 20,500 megawatts (MW) or 3% of total U.S. peak demand, while actual delivered peak demand reduction was about 9,000 MW or 1.3% of peak demand, leaving plenty of margin for improvement. To encourage the use and implementation of demand response in the U.S., the Federal Energy Regulatory Commission established a new rule in

March 2011, which defines a certain level of compensation for demand response providers. This was a big deal to the extent that the federal government regulates transmission and state governments regulate distribution. The federal government directed transmission operators to make certain that the demand side could participate in the flow of energy and that is what really grew the whole demand response marketplace. Today it's worth about $2 billion only in those selected areas that are deregulated enough to have independent system operators in the U.S. It's clearly brought more efficiency into the marketplace. There is no question that the introduction of demand response has brought the peak price of electricity down and has reduced the likelihood of electrical outages, so that's one clear example of an enabling regulatory environment. Where it hasn't worked well, for example, also in the U.S., is with some of the smart metering initiatives that took place as a result of the stimulus spending that the federal government provided through the DOE (Department of Energy). There was circa $5 billion available for smart grid grants in 2008–9, and almost all of that capital was awarded to deploy smart meter devices. One of the grant criteria requirements was a 50/50 funding between the federal government and state utilities. The utilities would submit an application to the DOE to deploy smart meters, for example, in businesses and households, and the federal government would match the funding. However, each individual state has a regulatory body, usually some sort of a Public Utility Commission (PUC) that approves any matter concerning the structure of state utilities' tariffs and spending. Many smart meter projects were rejected by state regulators because of a perceived lack in payback on the investment. The state regulatory bodies needed more evidence for a return on investment for smart meters in order to justify the match funding by the utilities. There is clearly value for a distribution utility to have smart meters installed with industrial and commercial consumers, but the question remains as to the value of smart meters for residential consumers. There have been various pilots to explore this question but the benefits are yet unclear—some of the pilots have demonstrated that a properly constructed residential program from a utility perspective will change residential consumer behavior but others have been less successful. Nevertheless, there is no question that the cost of energy will go up in the future, households will become more sensitive to the rising price, and there will be a need for better incentives for residential energy consumers to more proactively manage their energy consumption—particularly in the context of the abolishment of energy subsidies by the federal government.

Ms. ABADY: *Can you please explain what smart grid initiatives the state regulators would have preferred to approve instead of smart meters?*

Mr. HENNEBERRRY: When the federal government announced the stimulus package for smart grid grants, they listed a whole range of initiatives that could qualify, including distribution automation, voltage regulation, smart meters, demand response, and new

types of business models for demand response. They received a deluge of proposals and decided to take a strategic approach to granting funds by directing almost one hundred percent of grants toward smart meters. The speculation is that the federal government saw it as their role to help lay the infrastructure for the smart grid. Much of the smart grid applications are data driven that require energy consumption information supplied by smart meter devices. So while a smart meter rollout would have had its merits, state regulators saw it as their roll to protect customers and demand more evidence of a return on investment on any initiative they approved.

Ms. ABADY: *Do you see the electricity distributors of today being the same electricity distributors of tomorrow, specifically in the U.S.?*

Mr. HENNEBERRY: The U.S. has a hybrid energy market model with some states still highly regulated and others deregulated. We got half way through the deregulation process in the nineties, which ceased following the Enron scandal. About 60% of the U.S. is regulated and about 40% is unregulated with most of the energy being consumed by the unregulated market. We don't particularly think we have to have one or the other to drive smart grid optimization, but by necessity, the business models of the future will be different. Business models in highly regulated areas like China can also be effective as they are highly tuned in to their regulatory environment. We do business all over the world—China, India, Europe, and the U.S.—and the solutions we have to develop for customers vary by territory.

Ms. ABADY: *What is the estimated cost of developing a smart(er) grid throughout the U.S. and what are the estimated cost savings of an active smart(er) grid?*

Mr. HENNEBERRY: The estimated cost is about $300 million in the U.S. and €200 billion in Europe but we don't think of it as a pure cost, per se. If the right technologies are in place within the right commercial and regulatory environments, then there will be cost savings through energy efficiency and optimization of capital expenditure (CAPEX) with an ROI. It might be that the CAPEX will turn out to be €200 billion in Europe but it won't be an investment on anyone's part. It will be savings that drive the growth in the smart grid. The timeframe for deployment to get grids smarter and smarter very much depends on the geography. In China for example, I was blown away by the speed in which they can implement changes once a commitment to a decision has been made, as there is little room for debate and stakeholder dialogue. The smartening up of the grid will extend through at least 2050 in Europe and the U.S. I think we'll continue to see more applications—it's just like anything when you continue getting into cost reduction capabilities, if you have the right framework, you'll continue to dig deeper and find more technology improvements.

Ms. ABADY: *Are we headed towards a Jetson–like universe of energy distribution?*

Mr. HENNEBERRY: That's an interesting perspective. I'll give you one example of an application that may fit the picture. An application that Schneider provides today for renewable energy generated from wind farms and solar farms can inform utilities in real-time of the amount of energy that can safely travel through the transmission cables. The capacity of the cable that connects the energy generated from the wind farm and solar farm to the end-user is ordinarily calculated by the cable manufacturer. In order to prevent cables from overheating, there are two capacity ratings: One for winter and one for summer. In the winter the worst case scenario is assumed given the limited number of amps that can be driven through the cables, and in the summer it's different because of heat and solar radiation, so the number of amps that can be driven through the cables need to be limited. Schneider has developed an application that can calculate in real-time (with a 20–30 minute delay) the actual capacity of the cable. So we now have an application where sensors on the cables measure variables such as temperature, wind direction, and solar radiation and with a model that intelligently informs the cables the carrying capacity at any given time rather than making assumptions that lead to energy waste as in past experience.

Ms. ABADY: *Can you please explain to us how the €200 billion required for the smarter grid in Europe will be self-funding.*

Mr. HENNEBERRY: As previously mentioned, the general answer is that the funding comes from savings. So the smart grid technology won't come from taxes, for example, but from a return on investment in energy efficiency improvements with real monetary returns for investors. However, the regulatory environment must exist to facilitate and monetize the savings. We are very interested in understanding this environment and advocating for end-users to make those savings available to them. We are working hard in Europe with the E.U. to understand what regulatory policies are needed to create this investor-friendly environment. Furthermore, we believe in learning by doing and we're very interested in collaboration with governments, large commercial end-users, and residential customers in order to prove the technical and commercial models that drive this investment thesis. Holding pilots to figure out learning by doing is a real focus of our strategy.

Ms. ABADY: *Can you please share with us what some of the smart grid investment opportunities could be for asset owners?*

Mr. HENNEBERRY: There are several opportunities certainly for wholesale energy users because they can invest in energy efficiency projects and have a direct return. Some of those projects are done in a business model called "performance contract" business

model so they don't actually pay for the capital. Whether you're the owner or the financier, there is clearly a whole raft of opportunities, particularly with software companies that are developing innovative applications that can be used for implementing smart grid technologies. There are a number of investment bankers focused on these technologies and there are at least 50–100 new software companies trying to prove that they have the best applications. Investments in the software companies would be more of an opportunity for private equity or venture capital with a higher appetite for risk. There are also a number of companies working on infrastructure plays in order to provide the necessary energy to electric vehicles, for example, in order for them to mobilize; so there are a lot of different areas related to the smart grid that are opportunities for investment.

Ms. ABADY: *Is Schneider actively making acquisitions in smart grid technologies?*

Mr. HENNEBERRY: Schneider recently announced the acquisition of leading software firm, Telvent, and is now going through regulatory approval. We don't anticipate regulatory approval issues and expect to get final approval sometime in the third quarter. Telvent is a Spanish company, and they are directly involved in the supply of smart grid applications. We also acquired Summit Energy from Louisville Kentucky, an energy management and sustainability solutions company. There are commercial and technical smart grid investment opportunities. While Schneider is invested in both sides, it's the commercial side that is bringing the new opportunities to end-use customers, including new energy procurement models for wholesale customers.

Ms. ABADY: *Is there anything else that you'd like to share with the readers of the* JEI*?*

Mr. HENNEBERRY: Well, I guess I would say that in many parts of the world the liberalization of energy markets, or the deregulation of the markets as we say in the U.S., is one of the key drivers for the solutions to a smarter grid, and optimization will naturally emerge from an open market, so we want to support the notion of an open market, where demand can compete with supply, and customers can shop around for their power. The other message is what I said earlier about collaboration. As an industry, we won't know what the right solutions are from a purely academic perspective. We need to trial various solutions so the idea of collaboration with policy makers, municipal governments, and big utilities—"trialing" solutions to see what is successful and understand where to increase our strategic focus.

Ms. ABADY: *Thank you for your time and for taking a moment from your busy schedule to talk to us during your visit to the UK.*

Mr. HENNEBERRY: It was a pleasure. Thank you for the opportunity.

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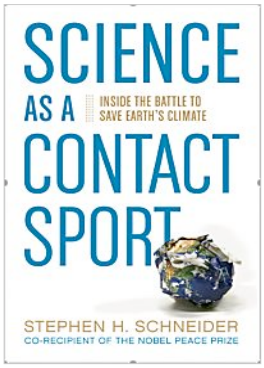
Scott Henneberry has spent many years in the electrical industry. During the first 20 years of his career, he worked for Siemens, which encompassed various marketing and operational management positions in the switchgear and power quality fields, including as marketing director for the substation automation and protective relaying division. For the next five years, he served as an executive officer of Power Measurement, Inc. (PMI), a small high-tech company in the electrical industry that provided turnkey hardware and software solutions to utility and industrial customers in the power-monitoring field. In his capacity as an executive officer at PMI, he was responsible for all aspects of marketing, business development, strategy, and mergers and acquisitions. Since the acquisition of PMI by Schneider Electric in 2005, Mr. Henneberry has focused on the strategic aspects of the power monitoring and control business for Schneider Electric. Most recently, he has been assigned to its global corporate strategy department, where he is responsible for defining and coordinating the implementation of the Schneider Electric Smart Grid Strategy.

Schneider Electric is a global specialist in energy management and provides technology and integrated solutions to energy infrastructure, manufacturing, data centers, buildings, and residential markets. In 2010, total reported sales for Schneider Electric were circa $28 billion. They employ 110,000 people in 100 countries. Schneider Electric SA shares are traded on the Paris Stock Exchange.

Book Review



Science as a Contact Sport: Inside the Battle to Save Earth's Climate, by Stephen H. Schneider, Washington D.C.: the National Geographic Society, 2009, 288 pages, $28.00 (hardback)

Reviewed by Todd Doersch

Stephen Schneider was a prolific pioneer of climate science and perhaps the field's most articulate and vocal advocate of the urgent need for mitigation of human-induced climate change. He died suddenly of a heart attack in July 2010 while flying from one climate conference to another. His legacy will be that of a clarion caller. If the world soon manages to come together to establish and enforce performance standards on emissions; to put a market-oriented price on carbon; and to institute strong incentives to innovate in clean-tech, then Schneider's leadership will have been one key catalyst. His enduring influence is evident by the symposium in his name, the 2011 Stephen H. Schneider Symposium on Climate Change: From Science to Policy, held August 24–27 in Boulder, Colorado.

Purposes of the Book

Schneider states that his book, *Science as a Contact Sport,* recounts "the story of how climate scientists gradually formed a strong consensus that human activity has produced potentially dangerous changes in Earth's climate" (p. 10). His insider's historical overview sets up his call to action: Schneider gives specific advice to scientists on how they can communicate better with politicians, the media, and the general public. He also gives strong advice to policy makers on concrete steps to take. And he tells the rest of us what we can do to make a difference.

In addition to his overt goal for the book, I sensed two additional unstated purposes: Schneider wants to provide a scorecard for us, a cast of characters to help the uninitiated interpret the cacophony we hear regarding climate science. And he wants to set the record straight on a few niggling points. I did appreciate his introduction of the personalities from climatology and his demystifying of the alphabet soup of acronyms routinely used in the

field. He was quite blunt in his criticism of those who pursued "persistent distortion" (p. 204), or perpetrated "scientific dishonesty" (p. 220), as well as in his praise of those he admires.

Context of the Book

Recall that the book was released in October 2009, just two months before the start of the momentous UN Climate Summit in Copenhagen, at which expectations were raised and then dashed for a successor treaty to the Kyoto Protocol. Clearly, Schneider was hoping his book would frame the debate and improve communications. His intentions might have come to pass, were it not for the infamous "Climategate" controversy that erupted just weeks before Copenhagen and usurped all attention away from Schneider's book. A cynical but plausible interpretation of events is that a party with a vested interest to see the Copenhagen summit fail orchestrated the cybercrime as a PR trap that the media fell for hook, line, and sinker. Whereas Schneider had tried to build trust by advocating a transparent process, the criminals who stole the emails of six academics in England were trying to undermine trust through obfuscation. Although far too late for Copenhagen, the findings of all inquiries into the episode concluded that not one scientific finding was discredited from the entire body of research contained in the Intergovernmental Panel on Climate Change (IPCC) (Schneider, Feb. 4, 2010).

Through the Lens of Investment Management

My background is economics and finance, not biology or climate science. Yet Schneider's book reveals that I—and many of my investment management colleagues—share considerable common ground with Schneider: We both are Bayesians who update our prior beliefs as the new information comes in. We both are model builders who continually enhance and refine models to predict a noisy future. We both estimate probabilities and designate ranges to our inputs and our outputs. In short, we both are accustomed to making decisions in the face of uncertainty with only partial information.

While we share some of the same toolkit, the challenges investment managers confront with those tools pale to triviality in comparison to the profundity of Schneider's focus. For example, when Schneider points out an "unfortunate overlap in time scales" (p. 257) (that is, it takes too long to establish statistical significance), he is not referring to a factor used to predict a stock's return. He means that by the time we ascertain definitively that CO^2 is a real problem, Earth will be far beyond irreversible "tipping points." Sea levels will rise dramatically, storms will be more extreme and damaging, cultural heritages will be lost, species will go extinct. The real costs of destroyed infrastructure and foregone benefits to society will be immense. Kind of makes tweaking an alpha model seem childish by comparison.

Confronting Critical Challenges

Schneider advises that we "protect the planetary commons" (p. 257), an allusion to Garrett Hardin's famous 1968 paper, "Tragedy of the Commons," in which Hardin formalizes a conundrum recognized by the classic Greeks as well (Hardin, 1968). Schneider states the conundrum thus: "I was sometimes disgusted how national interests trump planetary interests, and the here-and-now overshadows long-term sustainability" (p. 193). Since before Aristotle, people have recognized the individual incentive to exploit a free externality, even though by doing so, the value of that externality erodes toward zero for the entire community. Schneider proposes a conventional solution for the tragedy of the commons: "The price of energy should reflect all the costs, including damages to nature and society from unpriced emissions" (p. 265). That is, put a price on carbon, so that the cost of carbon emissions can be taken into account in any manufacturing process.

Battling "bipolar framing" by the media is another challenge Schneider confronts (p. 259). He explains that well-intentioned journalists who seek two-sided "balance" in their coverage of science issues are actually committing a disservice to their readers by leaving the mistaken impression that both sides are equally credible. In science, unlike politics, there is a preponderance of evidence that has been tightly scrutinized by many well-qualified experts. Often there are other distinct, nuanced views—not just one diametrically opposing view—that have likewise earned their own respective levels of credibility through rigorous and, in fact, skeptical peer review. "Science is not about equality. Quality trumps equality," Schneider asserts (Schneider, Feb. 4, 2010). He offers guidelines for how scientists can communicate better to journalists: (1) Scientists must drop any superiority judgments; (2) Scientists must thoroughly explain how they arrive at their conclusions; and (3) Scientists must go into explicit detail on their websites (where depth is possible), in contrast to the highly abbreviated sound bites of an interview session (p. 229).

If neither the media nor governments are very good at sorting out relative credibility, then scientists must do it in structured organizations such as the Intergovernmental Panel on Climate Change (IPCC), in which Schneider was active since it began in 1988. He helped the IPCC crystallize and codify the distinction between evidence-based assessments of experts and values-based judgments of citizens. Judgments are the legitimate domain of public policy debate, in which issues and costs are weighed and in which every opinion is equal. Schneider defines this process as "risk management." But he draws a sharp distinction between risk management and risk assessment. Risk assessment requires extensive scrutiny and confirmation of scientific findings in a forum of experts. The IPCC provides just such a rigorous forum in which over 180 climate scientists from around the world review and interpret existing scientific literature. The goal of the IPCC is to provide

evidence-based analysis to the policymakers, whose debates will thereby be better informed. The IPCC should not be viewed as a biased advocacy group, according to Schneider (p. 142). Fellow founder of the IPCC, Bert Bolin, said "To gain international credibility, the process must involve witnesses that many nations and groups can trust. The combination of expertise and witnessing the legitimacy of the process is what has made IPCC so effective." (p. 142)

Communicating Probabilities

Schneider insists that his academic colleagues apply consistent terminology when describing ranges of probabilities. He and others in the IPCC drafted a formal treatment of uncertainties in 1998 that applied a quantitative scale to phrases like "very low confidence" versus "low confidence", for example. Assigning subjective ranges to such phrases required much negotiation, but brought hundreds of occurrences of such phrases into consistency throughout the growing body of climate research. This initiative became particularly important as the numerous strands of independent, specialty research evolved into closer interdisciplinary collaboration (p. 151).

Prescription for the Future

After clearly delineating the distinction between the agnostic, fact-based scientific method, versus the judgment-laden policy debates of "risk management", Schneider jumps explicitly over to the risk management side of the line, and shares with us his personal judgments on what we should be doing. Regarding the dilemma mentioned previously that it takes too long to gather definitive statistical proof, Schneider asks: "Why take major risks with the planetary life-support system when mitigating the risks can be done for a small fraction of the growth rate of GDP?" (p. 274) He advocates pursuing three mutually-reinforcing climate policy initiatives: establishing regulatory performance standards that require reductions in carbon emissions; putting a price on carbon (either with a direct tax on carbon emissions, or indirectly via a cap and trade system); and providing incentives to innovate in the realm of clean tech (p. 263). All three initiatives will require Herculean diplomacy skills to coordinate on international levels, a stage on which our planet has not yet exhibited much success. Still, Schneider is optimistic that we can come together, if only scientists and policy makers improve their communications. Schneider hopes that with attractive incentives in place, venture capitalists will encourage inventive entrepreneurs to develop clever carbon capture and sequestration. As a very last resort, only if the three initiatives have failed and Earth is clearly speeding past numerous disastrous tipping points, would Schneider countenance forms of "geoengineering" that attempt to cool the planet to counteract the warming effect of high CO^2 (p. 272).

Perhaps his most ambitious and idealistic suggestion is that the developed world should "help developing countries onto a clean and green pathway by literally leapfrogging over the industrial revolution to high tech, as has already happened with communications" (p. 266). Schneider's noble goal is to preempt the pollution that otherwise would be generated if 2.6 billion Chinese and Indians adopt the same carbon-intensive pathway followed by 1.1 billion Americans and Europeans. The math indicates that in order to reduce global CO^2, we need China, India, and the rest of the developing world *not* to follow our bad example.

Ethics, not Economics

Schneider acknowledges that the policy debates will be difficult largely because there will be both losers and winners with *any* scenario, including the "do nothing" scenario. He believes we must "fashion solutions to deal fairly with those particularly hard hit by impacts of climate change and climate policies" (p. 257). While everyone should like the sound of "fairness," game theory tells us there are numerous reasonable but conflicting ways to define fairness. I am less optimistic than Schneider that the planet will be able to reach consensus in the realm of ethics, given our poor track record thus far and our very disparate belief systems.

Setting the Record Straight

Schneider feels he must set the record straight regarding four unflattering episodes in his career; whereas I do not think he needs to be so defensive. He goes to some length explaining why and how he changed his stance early in his career from forecasting global cooling to warming based on refinements in his modeling. In another chapter, Schneider bends over backwards to articulate a posthumous rapprochement with Carl Sagan, with whom he had a public feud in the early eighties regarding the climate implications of nuclear war. In a third example, Schneider clearly is still chaffing from being misquoted in an interview in *Discover* magazine in 1988. Journalists and bloggers continue to malign Schneider by resurrecting the "double ethical bind" misquote. The forth case is an apology for being a very frequent flier and thus having a much larger carbon footprint than most other people. His students remind him that his positive influence over many people justifies his high personal carbon emissions. I think the book would be stronger if all four episodes were edited out.

Summary

Science as a Contact Sport by Stephen Schneider serves its intended purpose well as an historical review of how the relatively young field of climate science has evolved. The book puts to rest any lingering doubts regarding whether or not the earth is warming (it is),

and whether or not the change is human-induced (it largely is). The book also provides an impassioned and compelling call to action to reduce our carbon emissions before our planet reaches irreversible "tipping points." I picked up the book as an uninformed skeptic. The book induced me to inquire more deeply into the topics raised. I have gained a fuller appreciation for the complexities involved in climate research and policy negotiations, and I thank Steve Schneider for broadening my horizons and conveying a vocabulary that will allow me to be a more discerning consumer of news from the field of climate science in the future. For example, I look forward to tracking the activities of the Intergovernmental Panel on Climate Change (IPCC) and the United Nations Framework Convention on Climate Change (UNFCCC) as we approach the expiration of the Kyoto Protocol at the end of 2012. I heartily recommend the book to other investment management professionals.

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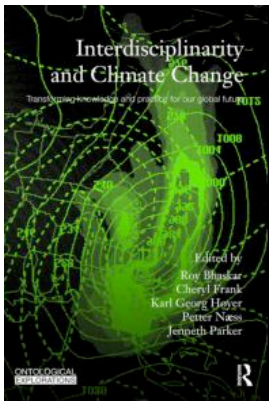
Todd Doersch is an Advisory Board Member for Blue Diamond Asset Management AG, a global investment management firm; and for Independence Equity Management, an early-stage venture fund. He also serves on the boards of the Chicago Quantitative Alliance, and the International Center for Futures and Derivatives. Mr. Doersch can be reached at tdoersch@independence-equity.com.

Book Review



Interdisciplinarity and Climate Change, edited by Roy Bhaskar, Cheryl Frank, Karl Georg Høyer, Petter Naess, and Jenneth Parker; Milton Park, Abingdon, Oxon, and New York: Routledge (Taylor & Francis Group), 2010, 258 pp., $150.00 (hardback), $44.95 (paperback), $47.95 (eBook)

Reviewed by Hunter Lovins

Interdisciplinarity and Climate Change is a fascinating book. Important even. Its subtitle, "transforming knowledge and practice for our global future," gives a sense of the breadth of its authors' ambition: to unveil an entirely new discipline while they strive to unite academic departments, and tackle perhaps the gravest threat to life as we know it on earth. The great environmentalist David Brower once said that a goal that can be achieved in one's life is not worth having. It may be that the authors have set themselves a worthy goal. But I sure wish that they'd done it in English.

Fair enough. Professors, unfortunately the only ones likely to struggle through such dense prose, would dismiss anything written in a way that Fox News viewers could grasp. And I'm a lousy academic, tolerating ungraciously pretensions with which "Post hole diggers" cling to their departments. But by restricting their audience and proposing yet another possible silo (they've even created an International Association of Critical Realism), Roy Bhaskar and Jenneth Parker, founders of this field they call "critical realism," risk proliferating the warren of segregated excavations into which academics delight in burying themselves.

The introduction touts the book's contributions to identifying areas of future research in the new discipline. Various authors refer periodically to a dreamy world where pure theory evades any necessity of relevance. *Interdisciplinarity* extols "contributions of theory to enable activist NGOs to collaborate in solving the linked problems of environment and development," although as founder and Board member of many of those NGOs, I was unaware that any lack of collaboration derived from inadequate theory.

Chapter 6 admits to seeking to make

> *Bhaskar's substantial body of emancipatory political, moral and spiritual philosophy increasingly effective in explaining and intervening in urgent social problems. . . . Bhaskar's ontology, together with his concepts of 'four-planar social being', 'the necessity for interdisciplinarity, 'maximum inclusivity', the meaningfulness of the world sui generis, the grounding in reality of human solidarity and the transcendental morality and reasoning of all human being provide philosophical stances which can begin to show the way in which this problem can be addressed and ameliorated.*

Really? This might entice acolytes, but is of little use to activists struggling to mitigate climate chaos before only adaptation and suffering remain. That said, the chapter usefully goes on to propose imagining more attractive futures to entice people to take the sort of action necessary to create them. This mirrors such work as The Future We Want project, which reminds us that the Futuramas of last century's world's fairs made consumers want the material and energy intensive lifestyles now plundering the planet. But The Future We Want uses high-end graphics, animation and personalized video to make alternatives real, arguably a somewhat more useful endeavor than "articulations of emerging and contending social imaginaries."

Perhaps I find the book delightful because the last chapter rightly mocks those of us who burn carbon to save the climate, orbiting the planet to attend extravagant and useless international summits to solve the crisis. But more, my own work defies categorization: I often ask academic audiences to tell me after a lecture whether my discipline is business, economics, engineering, biology, political studies, architecture, sustainability, urban planning, sociology, or atmospheric sciences. Yes, and now perhaps critical realism. Bhaskar and Parker write: "The radical inadequacy of piecemeal approaches to our joined-up world is presented on every page. . . . Crucially, critical realism demonstrates that it is not enough to have a metaphysical disposition to take a joined-up view; intellectual tools are required." And they intend to provide them.

Interdisciplinarity challenges education organized around departmental rigidity—as it should. The crises facing the world do not confine themselves to neat categorization. One of the finest practitioners of development implementation now lifting Kabul street orphans from the sex trade into school and honest livelihoods, through the manufacture of fuel briquets from waste paper, is a civil engineer. The founder of biomimicry, bringing biologists to the design table, was an English lit major who wrote field guides. The best

environmental educator is a political scientist.[1] Rigid disciplines do more today to shield students from the questions begging answers and the knowledge they need than they help educate a generation hungering to be a part of the solution.

It's a daunting task, though. As I was writing this review in May 2011, the International Energy Agency reported that despite the recession of the last several years, in 2010, carbon emissions from burning fossil fuels reached the highest rates ever reported: 30.6 gigatonnes (Harvey, May 29, 2011). The year 2010 tied for the hottest year on record. This renders the international community's scientific goal of limiting global warming to 2°C—itself considered by many scientists as far too high—all but unreachable. The US National Snow and Ice Data Center reported that the rate of permafrost melt in the arctic will force an irreversible tipping point within 20 years "with potentially catastrophic implications for climate change" (Connor, May 30, 2011). At the same time, the Noble House trading firm projected that China (with millions of people now without drinking water and facing power outages from the worst drought in 50 years [Kurtenbach, May 26, 2011]) will double coal imports by 2015, with India right behind. As oceans acidify, crops fail, and island nations sink beneath the waves, the climate crisis is very real. However, even with this challenge as the organizing focus, *Interdisciplinarity* reads as if unsure whether it is providing coherent and pragmatic policy prescriptions or establishing new ontological catechisms by proving why solutions are scarce when problems are not considered in an interdisciplinary manner, and by providing arcane case studies.

For example in Chapter 10, Karl Georg Hoyer spends a lot of verbiage considering the advocates in Norway (and elsewhere) who seek a nuclear renaissance of thorium reactors, noting that Norway has large amounts of thorium. Hoyer describes how a revival would have to overcome the historical context of Three Mile Island and Chernobyl (an unfortunate reality of print books is that the now global rejection of nuclear power amidst the ongoing tragedy in Japan is excluded). Useful, technical details on why the thorium fuel cycle is not as nasty as conventional fission are fascinating, but wouldn't it have sufficed to have a paragraph in the book's introduction concluding, as Hoyer ultimately does, that thorium is a non-answer to the climate crisis? Only at the chapter's end does it correctly observe that the one trial reactor under construction in Belgium is still not functional after 20 years. Just noting that even a appallingly expensive crash program in Norway would not have a thorium industry at full scale much before 2050, entirely too late to be of any use in solving the climate crisis, should have sufficed.

[1]The three people described here are Dr. Bernard Amadei, founder of Engineers Without Borders and director of Engineering for Developing Countries; Janine Benyus, co-founder of Biomimicry Guild and founder of the nonprofit Biomimicry Institute; and Dr. David Orr, professor, lecturer, and writer.

Hoyer's real concern, however, seemed not with practicalities, but to prove that this debate is an example of what he calls "technological idealism." He argues that advocacy claims, while true, can lead to the wrong outcome. "The discourse is real, and the claims it is founded on are just as real, but that does not imply that they necessarily are realistic or even true. Claims like these can be part of reality, but still be false." For example, thorium may be better than conventional fission reactors, but it still cannot solve the climate crisis. He likens this to the situation in particle physics, in which he laments, "Purely theoretical works have become common, works where their relation to reality is largely considered a non-issue."

Fair point, but the critique of using rhetoric to argue for bad answers, while fascinating, is clearly of greater interest to philosophers than to activists who are bludgeoned by this practice every day.

Snarky quibbles aside, the editors have assembled an impressive stable of international experts to make their arguments. Although just what critical realism might be (as opposed to uncritical fantasies of those who lay awake at night wondering whether what works in reality can possibly work in theory?) remains a mystery, clearly the approaches we've all used to date are insufficient. Perhaps it's time to give their approach a try.

Many of the contributors have long labored to knit together disparate university programs, cross-pollinating departments to enable students to tackle real world problems in ways that might deliver useful solutions. And that is clearly desperately needed.

The take-home chapter is Bob Costanza's "The need for a transdisciplinary understanding of development in a hot and crowded world." Justly famous for his formative role in creating the academic discipline of ecological economics, Costanza understands what the proponents of critical realism face. Rather than fuss about theory, however, he nods to the field, then sets forth the sort of pragmatic principles and policies that enable practitioners to achieve "ecological sustainability, social fairness and economic efficiency." This eminently readable chapter describes the mental model that got us into the mess, of which climate chaos is only one manifestation, and more useful ones that might get us out. He reprises ecological economics in ways that offer practical guidance to policy and effective action to deliver higher quality life to all people.

It's unfortunate that the book did not focus on the business case for solving the climate crisis. Many of us believe that market mechanisms remain the most potent tool for implementing the known technologies to meet our energy needs affordably and abundantly with energy efficiency and renewables. *Climate Capitalism*, my recent book

with Dr. Boyd Cohen, profiles what entrepreneurs, companies, and communities are doing to build prosperity, create new jobs and enhance national security. But the sobering statistics above show that even greed may no longer be a sufficient incentive to overcome the well-paid climate deniers.

Perhaps a dose of critical realism is what the world needs.

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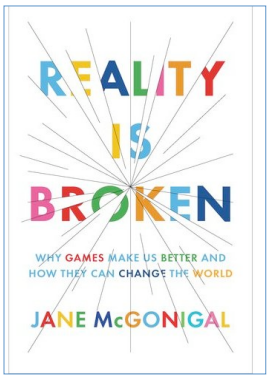
Book Review



Reality Is Broken: Why Games Make Us Better and How They Can Change the World, by Jane McGonigal, New York: The Penguin Press, 2011, 400 pp., $26.95 (hardcover), $12.99 (eBook)

Reviewed by Lee O'Dwyer

In *Reality Is Broken,* Jane McGonigal has distilled her PhD and a decade of work into an immensely enjoyable read that sheds a new light on the often-stereotyped world of gaming. In the past I have found myself cringing as my kids ask to play their PS3® or Wii®, even when they respect our "no games on week nights" policy. I wonder: Shouldn't they be outside or engaging in something more productive? However, after reading McGonigal's thoughtful treatment of the subject, I am now more likely to play with them.

Game Theory and Investing

But why review a book about gaming in *The Journal of Environmental Investing*? Game theory has long had a place in environmental economics and investing. It has accurately described the costs and benefits of issues like cross border pollution, acid rain, and overfishing in open waters. The environmental economy frequently runs into a free-rider problem, and game theory has often been used to develop regulation designed to curb cheating and selfish acts. Of course, regulation designed to change behavior is littered with failures. Readers of Adam Smith's *The Money Game* will immediately recognize that many of the traits found in successful games appear in investing: a goal, rules that must be followed, a feedback system to improve performance, and voluntary participation through allocation of capital.

But don't get the wrong idea; McGonigal's book isn't about investing. As the subtitle suggests, it's about "why games make us better and how they can change the world." With it, she has opened a new dimension to solving social issues, introducing ideas like "happiness engines" that might help us approach global problems, whether hunger, sickness, or climate change, in a profound new way.

The Practical Benefits of Gaming

The *reality* that the title of the book suggests is *broken* relates to our world versus the gamers' world. In fact, there is a laundry list of our reality's attributes that are negative when compared to the artificial reality created in successful games: too easy, disconnected, unrewarding, and unsustainable, to mention a few. "But in at least one crucially important way, reality is also *better*: reality is our destiny." McGonigal sets out to explore fourteen fixes (my favorite being *Fix #12: seek out more epic wins*), aimed to draw out the practical benefits of gaming. She points us toward "possibly the most primal emotional rush we can experience. . . . after we triumph over adversity"—*fiero*, "the Italian word for pride"—and goes on to describe Csikszentmihalyi's research on *flow* (*Beyond Boredom and Anxiety,* 1975). We are then drawn toward the conclusion that "we can stop reminding each other: *This isn't a game* [rather we] can actively encourage people instead: This *could* be a game."

An Engagement Economy

McGonigal isn't directly challenging us as investors. If anything, she is articulating a challenge to the gaming community, which she first espoused at the 2008 Game Developers Conference. However, I think it is more than fair to infer from the text that if we are serious about solving environmental issues through investing, then a growing amount of our allocated capital should to be directed toward creating a collaborative solution. Do you know that "gamers have collectively spent 5.93 million years" playing *World of Warcraft*? McGonigal states "by that measure we have spent almost as much time playing *World of Warcraft* as we've spent evolving as a species." Facebook has, of course, demonstrated the power of social connectivity. By making a game of it, the UK's *Guardian* newspaper successfully recruited 20,000 Brits to review 170,000 documents in three days, exposing Members of Parliament's fraudulent expenses.

McGonigal's work makes it clear that "gamers are readily engageable citizens," but she has also exposed a broader condition that can be extended to non-gamers. The suggestion of an *Engagement Economy* providing "sustainable intrinsic rewards" is a powerful notion, which should not be viewed as some kind of utopia. Consider how Wikipedia has articulated the power of crowdsourcing: What are the implications of directing a fraction of the 1.7 billion Internet users toward your environmental goal? In fact, it is already happening: *Lost Joules* is a social participation game in development that encourages energy conservation at home by utilizing smart meters; *EVOKE* is a World Bank Institute game focusing on, among other things, sustainable energy.

Social Participation Aimed at Generating Demand

The idea of social participation is not new, but *Lost Joules* allows us to consider promoting a behavioral change that could improve our environmental condition. After all, the concept of society competing over energy savings has wide ramifications. So what is the nexus of these seemingly disparate fields, and the benefits to the environmental investing community? A brief summary of the major factors impacting environmental investing must include both the science behind climate change, and the economics. If we accept that climate change exists, we can identify the costs of doing nothing, but we also have to consider the cost of switching behaviors and adopting new technologies. Another factor is about making new discoveries, or developing technologies, that can provide solutions and offer investment opportunities.

The problems of economics and technological innovation often meet around the issue of demand. Assuming that cheap, universally applicable technologies are few and far between, we require an end demand for the products our investment dollars target. Demand drives profit and profit drives innovation. In my opinion, McGonigal's work clearly illustrates how gaming might offer a new perspective on demand and advance our thinking regarding how to generate it. Creating a natural demand through games will alleviate the free-rider problem. If we want market-based solutions to our environmental challenges, we need to mobilize our financial capital in new, innovative ways to drive a demand for solutions, including the technologies and discoveries that drive profit.

Consider how market forces created the Chicago Climate Futures Exchange. In large part, the Exchange identified the environmental balance sheet issues surrounding sulfur dioxide. If you have a SO_2 liability you can trade it for somebody's asset, but is overall SO_2 production reduced, or have we simply stopped further growth? What about the US love affair with ethanol in the last decade? Multiple IPOs, political stump speeches, and excited investors abound, but no real demand was created (I'll leave the technological feasibility discussion alone).

Empower Environmental Behavior

Remember the concept of an *engagement economy*? Marketing dollars are designed to increase brand awareness and influence demand, but the environmental investor should consider it imperative to redeploy some capital toward creating an *environmental* engagement economy. There are growing markets that illustrate the power of this idea. For example, socially responsible investing has become a way to express your views through investments. Buying a carbon credit along with your airfare is becoming increasingly popular. We have smart meters at home, treat our cell phones like a new appendage, and wear *bodybuggs* that track our health and fitness. Think again back to the example of *Lost*

Joules: Can we improve these already indispensible items to track our environmental behavior and create a global game that drives a new economic demand, such as selling personal carbon credits?

McGonigal has given us a mechanism; our challenge is to frame the discussion toward our desires and create a game that produces the required action. *Seek out more epic wins.* If it is compelling enough, we won't need to discuss whether the human race is causing climate change, we'll be creating the demand required to reverse it just by playing. Remember, "This *could* be a game."

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