POLICY FORUM

CORPORATE SUSTAINABILITY

Scientifically assess impacts of sustainable investments

Metrics can inform investors wary of "green washing"

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The practice of selecting and managing financial assets based on their social and environmental performance is undergoing rapid growth and fundamental change. Investors are increasingly pressed by asset owners to prove how one company's practices are materially more or less sustainable than those of another. Yet, the basic information that companies declare is hardly standardized and is difficult to verify, with unreliable assertions (*1*) that are widely criticized as "green washing." Metrics are mainly restricted to documenting changes to internal business practices but offer limited guidance on whether a company's actions, products, and services promote human well-being or preserve environmental integrity in the external, real-world domain, fueling reluctance on the part of otherwise enthusiastic investors (*2*, *3*). It is here where science can play an important role. Our consortium of an asset owner, an asset manager, and two research universities is designing a next generation of traceable indicators to quantify external context and impact of investments and place these into a decision-making framework useful to investors. Tests of these science-based sustainability metrics are under way on a $2.1 billion portfolio of public equities invested on behalf of a large European pension fund.

Estimated growth in assets under professional management for sustainable investment is well above market growth rates worldwide (*2*, *3*). In the United States, sustainable investments grew 33% from 2014 to 2016 and now total nearly $9 trillion, or about one-fifth of all professionally managed assets (*4*). Several initiatives have emerged to help guide sustainable investing, including the Principles for Responsible Investment, Sustainability Accounting Standards Board, and Global Reporting Initiative. While such efforts' primary focus on minimizing a company's operational and supply chain risks is important—e.g., via emission reductions, efficiency gains, or improved worker health and safety—such evaluation procedures fall far short of what is needed for true verification of company-level sustainability performance and may produce assessments and investment decisions that are at odds with sustainable development.

> ***"...a more comprehensive approach to impact measurement could be realized if the financial sector joins forces with the scientific community."***

Although the idea of linking actions to environmental and social impacts is not new (e.g., in economics and policy analysis), its broader value to financial decision-making, in a way that makes sense to investors, has yet to be fully embraced. Many large, publicly traded companies are actively developing and putting to work technologies that create business opportunities going well beyond compliance per se, as with the explosion of energy- and life-saving innovations in the 21st-century automobile, whose genesis can be traced to enforcement of the U.S. Clean Air Act of 1970 (*5*). Nevertheless, the positive social and environmental impacts of individual companies and their business activities have proven difficult to systematically evaluate.

SEEKING CONTEXT

One active test bed for assessing corporate sustainability performance is in carbon emissions management, with various protocols in place (e.g., Carbon Disclosure Project, Science-Based Targets). Given the well-mixed nature of the atmosphere, emitting one less ton of carbon should yield an identical positive impact regardless of the source. Thus, estimating climate change mitigation benefits becomes the relatively straightforward task of crediting the efficiency of a company's operations in avoiding emissions, often normalized to revenue, but with little attention paid to how those operations contribute to other environmental risks or how its products and services ultimately generate positive or negative impact (*6*).

Carbon accounting will have limited usefulness in the broader development agenda, like that represented by the United Nations Sustainable Development Goals (SDGs), where climate change mitigation is but one of 17 focal points. The SDGs require additional metrics on human health, access to clean water, poverty alleviation, biodiversity conservation, and many others. Positive contributions can no longer be considered to operate in a well-mixed box, as for climate. Given the social and economic disparities that the SDGs seek to redress, investment strategies need to target particular human beneficiaries or environmental systems. What is needed is the notion of context, by which a company's business model or manufacturing practices generate real-world impacts.

Context-oriented metrics move the investment process one step closer to identifying actual solutions, which tabulations of modified corporate operations alone do not necessarily uncover. The approach, then, is to go beyond documenting changes in facility-scale outputs and combine them with what we term outcomes and impacts, which by their very nature evaluate corporate products and services within broader environmental or human beneficiary settings. Such an expanded view of business practices, services, or products consumed begins to uncover counterintuitive results that are often masked by a singular focus on outputs.

For example, for publicly held companies selling renewable energy technologies, reductions in CO_2 and other air pollutant emissions at the smokestack (outputs) produce ambient air quality improvement (outcomes) and associated health benefits (impacts). However, the tabulated impacts are often poorly correlated with the originating outputs, especially if the investment choices embody large differences in plant technologies, the local electrical grid, and potential beneficiary populations living downwind (*7*). This means that a small renewable energy company in a re-

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gion with high baseline levels of air pollution could generate greater positive impact on human health than a larger company operating in a region where the air is cleaner and the electrical grid emits less pollution per megawatt-hour generated. Apart from its financial performance, that smaller company may be passed over as a good candidate for inclusion within a sustainability portfolio if that judgment were based solely on its much lower outputs of clean energy at the plant level.

Similarly, we have been designing human health impact scores for pharmaceutical companies. The monotherapy drug effectiveness from U.S. Food and Drug Administration–approved clinical studies is combined with the number of prescriptions per drug, epidemiological information from peer-reviewed articles, and official occupational health reports for related diseases to estimate life spans extended, hospitalizations averted, and sick days prevented by every drug. This information is then aggregated to the national scale, by company, to estimate overall health impact.

Because companies typically fail to disclose many of the details of what products they sell, where, and in what quantity, we are not yet able to explicitly link an investment dollar to a specific yield of impacts across an entire portfolio of large global companies. However, the causal chains linking an action to an impact have been well enough established in many cases for us to adopt some basic assumptions to compute corporate contributions to sustainability—for example, knowing that CO_2 and other emissions from power plants contribute to climate change and bear negative human health effects and that renewables reduce both emissions and their climate and health burdens. Until there is more comprehensive disclosure of information, however, estimating the benefits that a company's products and services accrue thus requires some pragmatic, simplifying assumptions (see the table).

In our pilot work, we use relatively abundant revenue data as a proxy for business activity at the country level, based on available corporate disclosures. We link these to estimates made by impact models operating on a geographical scale that captures the particular relevant health and environmental context. For example, the wastewater treatment impact model operates regionally with product deployments that are assessed with respect to contrasting dilution potentials in receiving waters. Health benefits are computed using country-level revenue information prorated by population.

Context-based metrics for investment decisions

Examples of metrics applied to holdings from the pension fund portfolio tested. Current data limitations necessitate practical simplifications that affect accuracy and precision. Access to more precise data on corporate products and services would enable the impact metrics to more fully capture environmental and public health context. The framework can adopt additional modules, representing alternative state-of-the-art impact assessment models and/or their outputs.

ASSESSMENT MEASURES	WASTEWATER TREATMENT	RENEWABLE ENERGY	PHARMACEUTICALS
Impact metrics *Data source: Combined business activity/technology/ sociobiogeophysical impact metrics, as proposed here*	**Outputs:** Volumes of wastewater treated (e.g., cubic meters per day) **Outcomes:** Pollutant concentration reductions in receiving waters (e.g., milligrams per liter) **Impacts:** Beneficiary populations drawing drinking water from downstream (1000s), stream length of improved fish habitat (kilometers below threshold)	**Outputs:** Emissions reduced (CO_2, $PM_{2.5}$, SO_2, NO_x) (e.g., metric tons per year) **Outcomes:** Ambient air pollution improvement (e.g., parts per million; number of smog alerts) **Impacts:** Lives extended, hospitalizations and sick days avoided, reduced health-care spending	**Outputs:** Spatially distributed drug sales **Outcomes:** Target populations reached (e.g., millions; % of total) **Impacts:** Lives extended, hospitalizations and sick days avoided, reduced health-care spending
Financial (standards-based) *Data source: Mandated corporate financial statements*	Valuation Corporate strategy and relative competitive position		
Environmental, social, and governmental norms (nonfinancial performance) *Data source: Voluntary or mandated corporate self-disclosure, sustainability reports*	Facility worker health and safety Environmental compliance Governance and ethical policies		

DESIGN AND PRACTICE

We see it as essential that metrics rely not only on self-disclosed corporate reports but also on data from recent advances in Earth observation and modeling, epidemiology, public health, nutrition science, demographic mapping, and life-cycle analysis of resource production and consumption, which all have the advantage of being, for the most part, transparent, reproducible, and peer-reviewed. Although these technical capabilities are supporting breakthroughs in understanding the complexity and causal links that bind human-environment systems, we repurpose the science to define context. In some of our work on air and water pollution abatement, we have been successful in "draping" corporate output data onto geospatial Earth system and human dimension data sets to compute outcome and impact indicators that explicitly link corporate manufacturing activities, products, and services to environmental and human beneficiaries (*7*, *8*).

Moving a step further, combining such measures with reported financial data would create intuitive, company-level metrics of value to sustainable investment decision-making—for example, using our computed impacts per dollar of revenue as an indicator of sustainable investment "efficiency" to facilitate comparisons across companies. This mixture of quantitative information brings with it the critical issue of data harmonization in terms of thematic, spatial, and temporal coherency, but frameworks from other domains, such as the Earth system modeling framework community (*9*), provide useful guideposts. Protocols being developed under the next generation of the Global Earth Observation System of Systems (NextGEOSS) to accelerate the adoption of Earth observations into business practices are another such resource.

Context-based metrics must also be able to evaluate cross-sectoral synergies, trade-offs, and unintended consequences associated with multiple sustainability end points (e.g., improved water management, human health, and biodiversity conservation). A company that is highly rated for reducing air pollution could simultaneously present material risks to occupational health and safety, or at the expense of clean water. Context also helps investors to more clearly define a company's potential reputational risk. For example, portfolio managers might automatically consider selling off holdings of a pharmaceutical company that is depleting water in a dry region and risking a major public backlash, but that decision might sensibly be reconsidered should the facilities serve large numbers of people in a developing country, where the positive health benefits per dollar invested in drugs are far higher than in wealthier nations (*10*).

A first and fundamental step is to establish a formal dialogue space for information

exchange and best practices, organized as a strategic alliance of asset owners and managers, companies, auditors, nongovernmental organizations, and scientists. The partnership would emphasize codesign of unified output-outcome-impact assessment frameworks and catalyze rational debate on the specific kinds of corporate disclosure and scientific data, their reporting frequencies, and spatial characteristics. In addition, the consortium would create momentum for third-party sustainability reporting and auditing standards, setting the stage for verifiable broad-scale indices. Established efforts like the Global Impact Investing Network, UN Global Compact, Sustainable Development Solutions Network, and World Business Council for Sustainable Development provide ready-made forums but would need to expand the current dialogue to consider new approaches that uncover and measure context.

NEW BUSINESS MODELS

To itself be sustainable, sustainable investing must ultimately yield financial returns. In a global survey of sustainable investment organizations (*3*), 98% of respondents reported that their investments either met or exceeded expectations for social and/or environmental performance, whereas 91% reported satisfaction with financial performance. And, despite the willingness of some investors to accept below-market performance on some of their managed assets in the name of public good or to seed new investment frontiers (*3*), the assessment model being tested here assumes that sound business practices based on durable social or environmental benefits translate into profit. This investment strategy rewards a long time horizon—the essence of sustainability—in lieu of short-range financial performance, which preoccupies much of the current market.

Although our own impact investment experiment has just begun, we see early promise that the fund being tested could ultimately generate returns competitive with a broad benchmark while producing measurable environmental and health benefits (*11*). Before initiating our study, stocks had already been selected on the basis of financial valuation; positive performance on environmental, social, and environmental risks in their operations and supply chains; and sales of products and services in four critical challenge arenas—water, climate change mitigation, human health, and food security. These impact categories, selected by the pension fund trustees themselves, are each indispensable to the global economy and present considerable environmental and social risks. Representative companies were also chosen based on how well their products and services potentially contribute to the SDGs. We are testing our metrics on this subset of pension fund assets.

Our explicit assumption is that financial and impact metrics can be combined in a portfolio without adversely affecting financial returns. Most important, well-designed impact metrics for public equity portfolios can be used effectively to inform asset owners, influence stakeholders, and shape investment decisions. The global effect of this transformation would be consequential and would reasonably be expected to save trillions of dollars by mitigating climate change, the growing water crisis, and widespread loss of ecosystem services (*12*–*14*).

In the end, a more comprehensive approach to impact measurement could be realized if the financial sector joins forces with the scientific community. The dialogue space proposed here could be used to negotiate the terms of engagement and confront difficult carrot-and-stick issues such as that regarding corporate data disclosure. If one agrees with the wisdom of mandated financial disclosures such as under the U.S. Securities and Exchange Commission, built on well-established accounting principles and standards, then it is not unreasonable to warrant authentication of nonfinancial information that investors would find useful. In fact, more than 50 stock exchanges worldwide (e.g., Securities and Exchange Board of India) encourage or mandate such disclosures today (*15*). Might inclusion of a particular company in a sustainable asset portfolio be made contingent upon authentication of mandatory self disclosures? If so, the reward to that company, beyond direct revenue generated, would be a bona fide declaration that it is promoting sustainable business practices, especially if the impact measures show the company outperforming its peers or broader benchmarks. The willingness of corporations to share detailed information in such an alliance—as increasingly demanded by their investors—will be as much a shift in corporate culture as in how companies report on sustainability issues. If such a change is realized, we foresee a huge investment space opening, based on verifiable net positive impacts.

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In the 12 years remaining to achieve the UN's Sustainable Development Goals, we see an opportunity to road test this and similar context-based frameworks. If sustainable investors can adopt suitable impact metrics to identify sustainable investment opportunities, the community of nations will have in the business community a new and reliable ally, thereby increasing the likelihood that the goals will actually be realized within this short, ambitious time frame. ■

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