CARBON YIELD INSIGHTS

Measuring the Greenhouse Gas Emissions Avoidance of Green Bonds

INTRODUCTION

The historic Paris Agreement is a global effort to limit the human-induced global temperature increase from pre-industrial levels to two degrees Celsius within this century. Critical to meeting the Paris Agreement is a meaningful and significant reduction in greenhouse gas ("GHG") emissions globally.

Since their emergence in 2008, green bonds appear as a viable potential scalable solution to fund climate change mitigation and adaptation projects – growing to over US$340BN in terms of amount outstanding.[1] The vast majority of green bonds fund mitigation-related activities, making them a powerful tool for supporting the Paris Agreement. The scale of mitigation, however, can vary greatly across green bonds and their funded activities.

The question therefore arises: how to provide transparency and information to investors and policymakers about the climate change mitigation potential of diverse projects to guide allocation of capital to optimise for GHG abatement? To attempt to remedy such information asymmetry, the Carbon Yield initiative was launched in 2016 to help measure the climate change mitigation impact of green bonds.

WHAT IS THE CARBON YIELD?

The Carbon Yield™ is a methodology which quantifies the climate impact of a green bond in terms of GHG emissions avoided through the financed activities.[2]

The impact quantified by the Carbon Yield is expressed in Potential Avoided Emissions (PAE) enabled by the use of proceeds in terms of per year/unit of capital. In other words, how many tonnes of carbon dioxide equivalents (tCO_2e) are expected to be avoided per year per unit of investment.

e.g. Company Corp. €500 million 02/2025 3.5% 0.735(CY)
(CY) = tCO_2e/year/€1,000

The Carbon Yield:

- Can be used to assess a portfolio of existing green bonds;
- Can be published by issuers of new green bonds;
- Is applied at the framework level: i.e. one Carbon Yield for one framework
- Can be used by anyone;
- Is publicly available; and
- Allows upfront assessment of the impact of different green bond frameworks

[1] Bloomberg Terminal, as of August 2018

[2] The Carbon Yield enables investors to determine the potential avoided emissions of Green Bonds.

THE METHODOLOGY

The Carbon Yield is one of the first methodologies to present a comparable, quantifiable metric that can be used by a variety of stakeholders, such as issuers, investors and analysts. The methodology looks at the projects financed via a green bond and then allocates to the bond the greenhouse gas emissions mitigated based on the projects' capital structure. Investors can aggregate the Carbon Yields of different bonds in their investment portfolios to obtain a portfolio level Carbon Yield. This can then be communicated to their own investors and other stakeholders as part of their impact reporting. By using the Carbon Yield, investors can ensure that the mitigation impacts of their green bond holdings are being calculated consistently.

Carbon Yield is a Rockefeller Foundation supported initiative and results from a collaboration between Lion's Head Global Partners (LHGP), a specialist merchant bank and asset manager; ISS-climate, part of the responsible investment arm of Institutional Shareholder Services Inc.; and Affirmative Investment Management (AIM), a dedicated impact bond asset management company.

CALCULATING THE CARBON YIELD

AIM partnered with ISS-climate to calculate the carbon yield on over 55 green and sustainability bond issuers over two years as part of AIM's annual impact reporting. The issuers combined have financed over 800 projects across 80 countries. Extensive engagement was required between AIM and ISS-climate and the green and sustainability bond issuers to retrieve sufficient data to apply the methodology to AIM-managed impact bond funds.

This report summarises the experience and findings in applying the Carbon Yield methodology over a broad range of issuers – from European corporations to multinational development banks – and more importantly, a broad range of funded activities across a breadth of geographies.

Key Finding 1

Renewable energy generation remains the most prominent sector in high Carbon Yield performance – that is, renewable energy generation results in higher amounts of GHG emissions avoided per $1,000 invested than any other sector. This trend largely holds across geographies, when compared to GHG emissions avoided from other green bond funded sectors. It is possible, however, that other technologies with higher abatement potential were funded but not included in the analysis due to insufficient disclosure from issuers. The prevalence of renewable energy projects among high Carbon Yield results corresponds with the types of investments required to reach the Paris Agreement's two-degree target.

Energy production and use account for two thirds of global GHG emissions,[3] making energy a priority sector in the context of meeting the Paris Agreement. Renewable energy is at the centre of the transition to a less carbon-intensive and more sustainable energy system, which in turn underpins the decarbonisation of other sectors, such as electrified transport. The International Energy Agency ("IEA") models pathways to support the Paris Agreement and the 2015 Sustainable Development Goals, hereafter referred to as two-degree scenarios (2DS). In the IEA 2DS, the global share of

[3] Energy and Climate Change, International Energy Agency (IEA), 2015

renewable energy, such as solar, wind, and hydro, must grow substantially – combined they need to form more than 60 percent of power generation by 2040.[4]

Green bond investments in renewable energy generation in countries with carbon-intensive energy systems, as represented with high emission factors, produce the strongest Carbon Yield results – that is, larger amount of GHG abated per $1,000 invested. These are generally the countries, such as China and India, where such investments are most needed not only to meet the Paris Agreement, but also to improve energy access and reduce pollution from heavy fossil-fuel usage – all critical components of the IEA's sustainable development 2DS.

Renewable energy-related investments, such as connecting renewable energy to a national grid or the manufacture of components such as wind turbines, did not perform as well as renewable energy generation projects in terms of high Carbon Yields. Nonetheless, both types of investments, direct generation and along the renewable energy value chain, are considered necessary in a low carbon transition.

While the Carbon Yield is a valuable metric in describing the abatement potential of a project, it does not currently capture the broader ecosystem needed to support 2DS decarbonization. For simplicity and comparability, the GHG emissions abatement is allocated based on the life cycle cost of a project. If the project that is being financed is only a minor cost in the life cycle of a larger infrastructure initiative, the abatement potential corresponding to its share in its total cost can be fairly small, even though it is a vital component for the successful execution of the project. For example, an ever-growing amount of increased renewable energy generation capacity is insufficient if the low-carbon energy cannot be distributed and/or connected to electric grids meaningfully. However, grid improvements by themselves yield little carbon abatement in Carbon Yield's attempts to limit double accounting.

Investments in renewable energy in markets with carbon-intensive grids and a heavy reliance on fossil fuels in the national energy system produce the largest GHG abatement return. A global comparison of Carbon Yields therefore shows an inherent bias towards renewable energy generation investments in emerging markets, when looking at the GHG avoidance results alone. For comparison, the grid emission factor for electricity generation for Sweden, at 12 gCO_2/kWh, is significantly lower than China's of 684 gCO_2/kWh.[5]

As the green bond market expands, it may be more appropriate to compare the Carbon Yields of issuers within a region or on a peer basis. For example, a renewable energy project in China, the world's leading GHG emitter by a long stretch, will have a higher Carbon Yield than a similar project in Sweden. However, we believe it would be imprudent to disincentivise further investment in the latter. Moreover, the Swedish baseline may be more comparable to others within the Nordic region.

Key Finding 2

Projects targeting energy efficiency show mixed results. Energy efficiency is an important component to the IEA 2DS (representing 44% of total emissions reductions required[6]); however, the

[4] World Energy Outlook, IEA, 2017

[5] IEA, 2017

[6] World Energy Outlook, IEA, 2017

scale of energy efficiency, and the context within which these efficiencies take place matter. Measuring the abatement potential of energy efficiency projects is also methodologically challenging when given limited information, as it is so context dependent, particularly on the carbon intensity of the existing energy system and comparable alternatives. For example, a public transport energy efficiency project in a country with well-developed public transport systems, and lower-energy carbon intensity, such as France, will likely produce a lower level of GHG abatement compared to a similar project in a country with a lack of public transport and higher carbon intensity, such as Indonesia. The measure of Carbon Yield in energy efficiency investments is still highly dependent on the existing energy mix.

The sector and technology where the energy efficiency improvements are made also matter in determining impact. A project improving the energy efficiency in a carbon-intensive process can yield significant savings; however, such a project can contribute to the "lock-in" effect of promoting the longevity of carbon-intensive activities, such as improving efficiencies within the oil refining industry. For some investors, investing in improving energy efficiency in carbon intensive, fossil-fuel based technologies may be considered a highly impactful strategy and part of a low-carbon transition, while others may find it entirely counterproductive in the journey towards a two-degrees future, since the project would make carbon-intensive technologies more competitive and long-lasting. The user of the Carbon Yield data therefore needs to consider the metric in relation to its context – it is not always the case that the larger the number the better.

The difference in costs between technologies was illustrated by McKinsey & Company in their Marginal Abatement Cost Curve for climate impact abatement[7]. The curve presents a variety of measures with the potential to mitigate climate change and the costs associated with its implementation. It highlighted the difference in cost and mitigation impact between technologies, showing that most technologies necessary to severely reduce emissions already exist and can be implemented at a reasonable cost. For example, simple energy efficiency measures such as switching to LED lighting has the potential of significant greenhouse gas emissions reductions while saving money for the implementing parties whereas Concentrated Solar Power and Carbon Capture and Carbon technologies require more substantial investments. As different technologies and sectors require different solutions the curve illustrates that certain necessary efforts may have a higher cost per tonne of CO_2e mitigated depending on the nature of the mitigation effort.

Key Finding 3

As a measure of impact on investment – costs matter. The Carbon Yield apportions GHG abatement impact of green bonds to $1,000 invested. This allows a simple comparison across geographies and sectors on the expected abatement per unit of investment, which can be a very efficient means of comparisons for a global investor. However, it is important to note that the impact return can be affected by several non-carbon related factors.

Technologies carry different capital and operating costs across different geographies: for example, comparing the construction costs of new light rail line in Norway to an LED lightbulb replacement project in India. The methodology does not consider foreign exchange effects – for example, a $1 of investment in India does not carry the same purchasing power than a $1 in Norway.

[7] A revolutionary tool for cutting emissions, ten years on, McKinsey & Company 2017

Project costs and the green bond investment share of the total project cost are also critical to appropriately allocate impact. Currently, this information can be very difficult to ascertain, and we highlight the importance of this type of data in limiting double counting.

The Carbon Yield methodology is unique in its guidance on apportioning impact to fixed income investments, such as green bonds. It endeavours to limit double counting where possible and attributes impact to both equity and debt investors and recognizes that both types of capital are required for the activities funded (e.g. debt is not "emissions free" following a logic where only equity incurs GHG emissions). This approach can be applied across many other impact assessment tools, and we encourage further development of such methodologies, such as a "water yield" or a "biodiversity yield."

Key Finding 4

Carbon Yield results quality is highly dependent on data accuracy and availability. The tracking of project-level data is an onerous and resource-intensive task. However, in AIM's experience as an asset manager, there are many benefits to the initiative, primarily in facilitating greater issuer and investor engagement. Overall, AIM and ISS-climate had a very positive experience in engaging with issuers, as many were able to provide additional data, or considered adapting their relevant disclosures.

In general, we believe that the quality of green bond reporting, including articulation of methodology and transparency, needs to improve. There is a considerable variation in reporting: the market has a few actors who dedicate significant resources and effort into their impact reporting, but the majority of issuers do not provide the same quality of disclosure. In the past two years, we have seen improvement, and most issuers are interested and willing to work with investors, such as AIM, in providing better information. The state of reporting would likely improve if more investors showed a greater interest in the results, which includes querying the reported data and requesting information where gaps exist.

Although AIM, an asset manager, is the only named user of the Carbon Yield methodology at present, we believe that issuers are best placed to use the Carbon Yield methodology going forward as they have the most data available. Transparency remains key, where possible at the asset-level, in order to improve the accuracy of the results.

The green and sustainability bond issuers included in our sample have all been verified by AIM as passing minimum environmental, social, and governance criteria, including sufficient levels of transparency and disclosure to enable impact reporting. We anticipate that Carbon Yield analysis will be very challenging to apply across the market given the divergence in reporting standards currently.

Key Finding 5

GHG emissions footprint data helps contextualise abatement results. In 2018, AIM and ISS-climate introduced GHG emissions footprint analysis, a measure of emissions avoidance, to supplement the Carbon Yield. This is to help mitigate some of the high baseline effects found in the Carbon Yield – for example, a Swedish green building project may have a low carbon yield, resulting from a smaller differential between project and baseline emissions as buildings are generally built to higher efficiency standards. However, the overall Scope 1 and 2 emission levels may be lower compared

with a project in another country yielding higher levels of avoidance due to higher baseline emissions. Both types of information are important.

LOOKING AHEAD

As the green bond market continues to grow, and discussions around further standardisation continue to develop, for example the European Union's High-Level Expert Group on Sustainable Finance (HLEG), the market remains dependent on voluntary initiatives. Carbon Yield is a publicly-available methodology aligned with GHG accounting best practice designed to promote consistency in reporting around GHG abatement for green bonds.

The interpretation of the data needs to be nuanced due to high baseline effects, but it remains a powerful tool in measuring green bond climate mitigation impact and supporting efforts to meet a two-degree future.

We acknowledge that green bonds finance a wide range of activities beyond those targeting climate change mitigation, such as water management and enhancing resilience against drought and floods. Carbon Yield measures impact only along the climate change mitigation dimension, expressed in terms of carbon avoidance per invested amount, which remains a limitation, but the lessons from applying the methodology to the diverse and growing impact bond market can inform measurement on other impact measurement methodologies.

About Affirmative Investment Management (AIM)

Affirmative Investment Management Partners Limited (AIM) is a dedicated green and social bond asset management company. It is an independent, owner managed Private Company established in 2014. AIM comprises of a team of individuals who have been strong advocates and instrumental in the evolution of the green bond market. Creating the original green bond eligibility template, the world's first green bond fund and the longest performance track record in the market place demonstrating no sacrifice to investment return. AIM investments support the 17 UN Sustainable Development Goals and the Climate Change Paris Agreement (UN COP 21) and our approach is a fusion of mainstream portfolio management and sustainability principles. For more information, visit www.affirmativeim.com

About ISS ESG

ISS ESG is the responsible investment arm of Institutional Shareholder Services Inc., the world's leading provider of environmental, social, and governance solutions for asset owners, asset managers, hedge funds, and asset servicing providers. Under the **ISS ESG** umbrella are three discrete units that draw on deep historical and industry expertise, including: *ISS-ethix*, which enables investors to develop and integrate responsible investing policies and practices, engage on responsible investment issues, and monitor portfolio company practices through screening solutions; *ISS-climate*, which provides data, analytics and advisory services to help financial market participants understand, measure, and act on climate-related risks across all asset classes; and *ISS-oekom*, which provides corporate and country ESG research and ratings and enables its clients to identifying material social and environmental risks and opportunities including through advisory services. **ISS ESG** clients rely on the expertise of all three to help them integrate responsible investing policies and practices into their strategy and shareholder voting decisions.

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