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Proposal For A Green Bond Evaluation Tool

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Executive Summary

S&P Global Ratings is seeking feedback on a potential new Green Bond Evaluation product ("the Green Bond Evaluation" or "the Evaluation"), which we are proposing be based on a newly developed green bond evaluation framework and scoring methodology. The Green Bond Evaluation is not a credit rating.

Our proposed Green Bond Evaluation methodology looks beyond the governance and management of a bond by providing an analysis and estimate of the environmental impact of the projects or initiatives financed by the bond's proceeds over its lifetime relative to a local baseline. This would be in addition to assessing the governance and transparency surrounding the bond. When evaluating environmental impact, the methodology would consider both climate change mitigation and adaptation projects.

Mitigation projects focus on efforts to reduce or prevent the emission of greenhouse gases, ranging from upgrades to conventional generation projects to new renewable energy and energy efficiency initiatives. Adaptation projects aim to take practical steps toward reducing the exposure to and managing the impact of natural catastrophes, such as building the resilience of communities and critical infrastructure against an increased risk of extreme weather events due to climate change.

Overview

- S&P Global Ratings is proposing a new product to analyze and estimate the environmental impact of bond projects or initiatives.
- The Green Bond Evaluation, which is not a credit rating, would consider both climate change mitigation and adaptation projects.
- The Evaluation would include a Transparency score, a Governance score, and a Mitigation score and/or Adaptation score, as relevant, to arrive at an overall final score.
- We are seeking feedback to our proposed Green Bond Evaluation product, framework, and methodology from investors, issuers, governments, multilaterals, and intermediaries.

The output of the Green Bond Evaluation would include at least three scores (a Transparency score, a Governance score and a Mitigation score and/or Adaptation score, as relevant,) and an overall final score as follows:

- The Transparency score would focus on the quality of disclosure, reporting, and management of bond proceeds.
- The Governance score would assess what steps have been taken to measure and manage the environmental impact of the use of proceeds of the bond including certification, impact assessment, risk monitoring, and risk management
- The Mitigation score would consider key environmental impacts of the use of bond proceeds, such as reductions in greenhouse gas emissions and water use. It is proposed to be based on a consideration of key variables (such as technology and location) that determine the level of environmental impact in each project. It would score the bond on a net benefit basis relative to the appropriate local baseline (for example, a new renewable energy project compared to the conventional grid). A broad range of project types could be considered within the Mitigation score

from prevalent green bond taxonomies (such as wind farms and energy efficiency projects) to other relevant projects that are a focus of various governments and multilaterals (such as gas-fired power plants, nuclear, and large hydropower plants, understanding that the perception of a green project may vary from region to region).
- The Adaptation score would reflect the estimated reductions in the costs of expected damages achieved by the initiatives financed. To determine the environmental resilience benefit that may be achieved through the use of bond proceeds, we would propose to analyze and assess the cost-benefit studies prepared for the project.

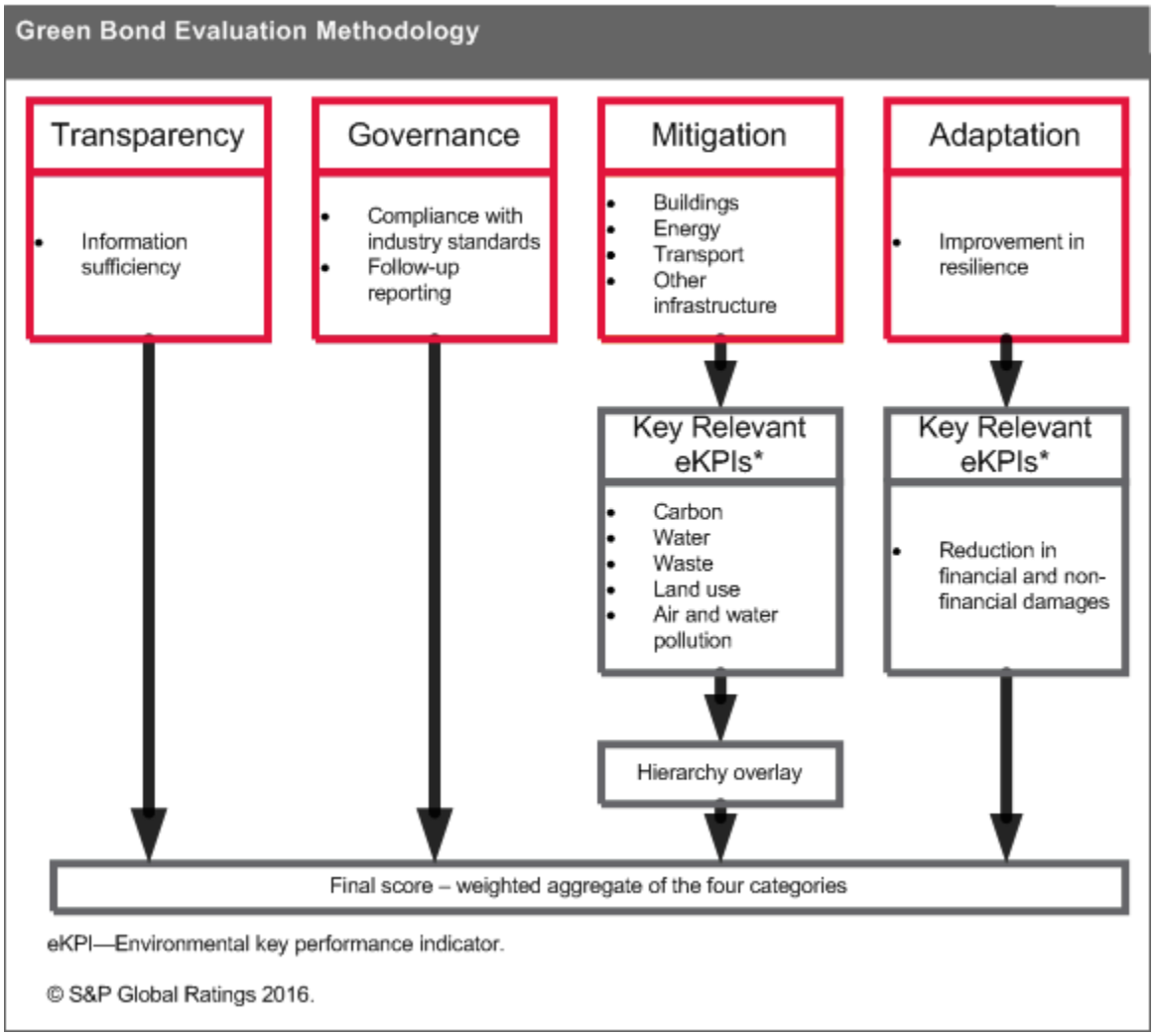
The proposed approach would evaluate a bond financing against each category, with the resulting scores weighted and amalgamated into an overall final Green Bond Evaluation.

The mitigation impact of an individual bond would also be assessed within a hierarchical sector overlay. The placement of the Mitigation score within the broader context of different sectors would indicate its relative contribution to the ongoing effort to avoid and cope with climate change.

This relative hierarchy would imply that projects that are financing climate change solutions, such as renewable energy, for example, would score more highly than projects looking to improve conditions within conventional technologies (such as coal-to-gas). The resulting Mitigation score would provide a flexible and user-friendly assessment of the relative importance of net benefit impact and broader technology-level considerations. For example, if a bond were financing coal-to-gas switching, the Mitigation score would reflect how the bond compared to best-in-class bonds within this project type, while also providing information on the difference between these and other project types, such as renewables.

We look forward to receiving your feedback to our proposed Green Bond Evaluation product, framework, and methodology and our specific questions below, and to discussing our approach on this important issue with investors, issuers, governments, multilaterals, and intermediaries. To access the survey feedback platform, please click on the following link or paste it into your browser: www.spratings.com/greenbonds .

Chart 1



Introduction

Progress

The green bond market is expanding. In response, in April 2016, S&P Dow Jones Indices, another division of S&P Global, published a consultation paper regarding the scoring of green bonds in order to create new green bond indices. As market interest for information relating to the green credentials of capital market instruments continues to grow, S&P Global Ratings believes that development of a Green Bond Evaluation product may further serve to meet informational needs of market participants. Today, S&P Global Ratings is asking for market feedback on the development of a tool to aid in the evaluation of green bond issuance.

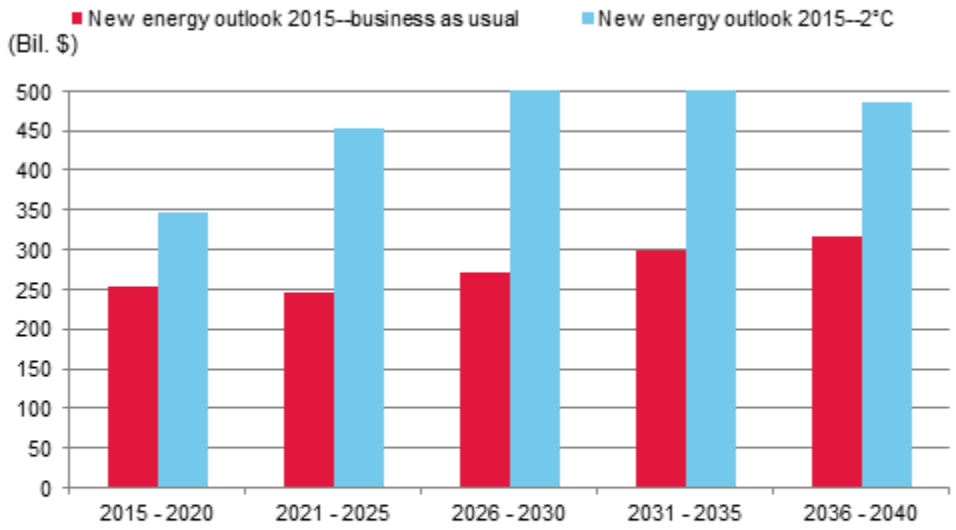
Context

Financing on a significant scale will be required to meet the Paris Agreement's target of limiting the rise in global temperature to no more than two degrees above pre-industrial levels. The International Energy Agency (IEA)

estimates this will cost around $1 trillion per year globally until 2050, which is approximately 1.3% of the world's annual output of goods and services. Bloomberg New Energy Finance (BNEF) recently estimated that $14.6 trillion would need to be invested into clean energy alone up until 2040; the corresponding average investment figures are outlined below in chart 2. Even without the Paris Agreement, BNEF estimate that a business-as-usual scenario would require expenditure of $9.2 trillion per year to keep up with global energy demand. This is only a fraction of what could be required overall to limit global warming, as it doesn't capture the future investment needed in the areas of clean transport (such as electric vehicles), energy efficiency, adaptation measures (such as flood defenses), sustainable agriculture, or the many other areas that will require development in the face of climate change.

Chart 2

Average Annual Investment Needs For Global New Renewable Power Generation



Average annual investment needs for global new renewable power generation up to 2040 under two scenarios: a business-as-usual scenario that continues according to the current trajectory; and a scenario that meets the target of limiting global temperature rise to two degrees above pre-industrial levels. Source: BNEF.

The sheer scale of the financing required has led to the development of a range of green finance instruments designed to increase investment flows into projects and technologies to prevent or mitigate climate change, to improve resilience, or help adapt to the impact of climate change. The potential benefits of these green finance mechanisms have received mainstream recognition, with the G20 finance ministers and central bank governors incorporating the topic, for the first time, into their meeting communiqué ahead of the G20 summit in Hangzhou in September 2016. Green bonds, which are issued to raise funds for new and existing projects with environmentally sustainable benefits, are the most prolific of the green finance instruments developed to date. Since the first green bond was issued by the

European Investment Bank in 2007, the market has grown to over $45 billion issuance so far this year, with approximately $150 billion in green bonds outstanding worldwide. At current growth rates, annual issuance in the green bond market is forecast to grow to over $100 billion within a relative short timeframe.

Opportunity

We believe that there may be a gap in the market for a green bond evaluation product that looks beyond the governance and management of a bond to measure what the green label means in terms of its qualitative environmental element, whether that is related to the mitigation of, or the adaptation to, climate change. This is borne out by reports such as HSBC's November 2015 green bond publication, which states: "We think that the market requires a single metric with which to gauge the environmental element of the green bond offering."

Currently, most second opinions cover important aspects of governance and transparency, but few provide comprehensive environmental impact evaluation. There are numerous taxonomies that list the categories of projects (defined as the assets or schemes financed by the bond) that are potentially eligible for green bond financing. However, these approaches face problems defining what is green, especially as climate change mitigation and adaptation technologies are expanding rapidly in many sectors. S&P Global Ratings is seeking to recognize the breadth of climate-related actions and initiatives that are qualitatively green by assessing the expected relative environmental impact of capital projects. As presently contemplated, our Evaluation would establish a method for assessing the potential environmental benefit of assets and initiatives funded by the proceeds of bond financings. We anticipate providing the proposed component scores that would support each overall Evaluation to provide users of the Evaluation with the opportunity to assess and weigh the relevance of the individual scores based on those factors users find most important in their assessment of green bond credentials. Over time, our intention is to develop the product so that it can assess the environmental impact of a broad range of projects or initiatives financed by a bond, whether it is labeled as a green bond financing project in line with the various green bond project taxonomies available or it is a conventional bond financing projects outside of current green project taxonomies that may nonetheless have environmental implications.

Question 1

Should all relevant project types be part of the Evaluation, or should some be excluded? (If yes, please expand on which project types should be excluded).

The investor community has articulated its desire to compare green bonds based on their environmental impact in a way that is similar to how they can compare bonds based on their credit quality, and to then take this further so that they can assess the "greenness" of multiple projects or a portfolio.

S&P Global Ratings is developing an analytical tool it thinks may help to fill this need. The tool is in the form of a framework that would be capable of assessing the environmental impact of projects aimed both at mitigating and adapting to climate change, as required. The tool would also take account of the adequacy of such projects' governance relating to their environmental impact, management of proceeds, and transparency and disclosure in line with assessments currently provided by second opinions.

Green Bond Evaluation Tool

Scope

Our proposed approach would address both mitigation of and adaptation to climate change. As outlined above, Mitigation projects focus on reducing negative environmental impact, such as carbon emissions, in order to stop climate change. Adaptation projects look to create resilience to the impact of climate change that is likely to be unavoidable, such as resilient subway systems in New York to cope with the increasing frequency of storms such as Hurricane Sandy, or flood defenses in coastal areas to protect against rising sea levels.

Scope of mitigation category. Initially, we expect this category to evaluate green bonds that finance four types of green projects or technologies: green energy, green transport, energy efficiency, and green buildings. We anticipate releasing a prototype of this product in the coming months. These initial four project types cover around two-thirds of the green corporate bond market issuance to date (including issuance by financial institutions). Depending on the success of that release, we may expand the range of projects that the tool is able to assess, to include water projects, coal-to-gas switching, nuclear, and large hydropower projects with further extensions possible.

Framework

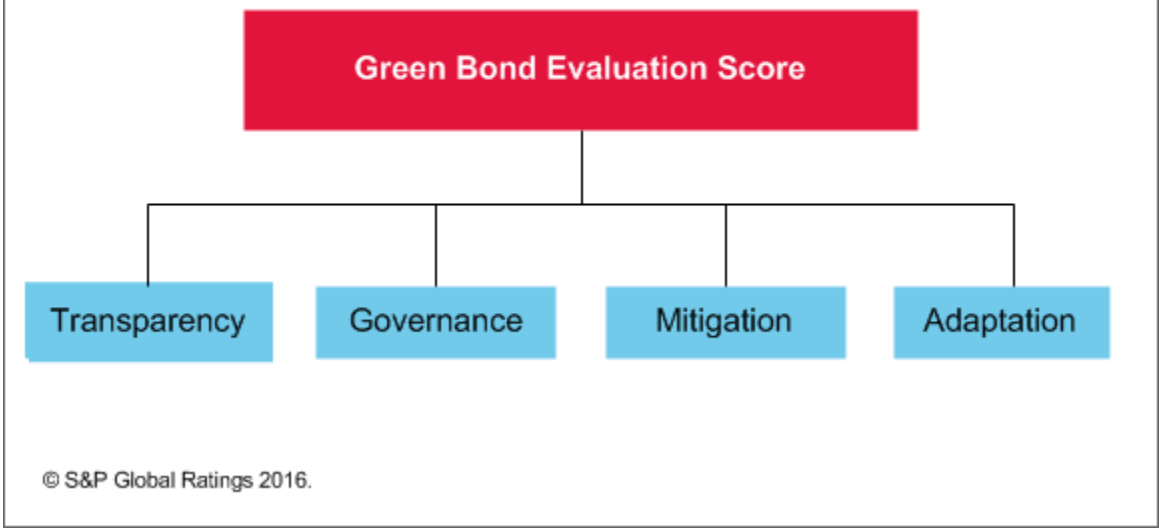
The proposed Green Bond Evaluation framework will assess four categories: transparency, governance, mitigation, and adaptation, as outlined in chart 3.

Question 2

Do you agree that these are the best project types (green energy, green transport, energy efficiency, and green buildings) to focus on initially?

Chart 3

Categories That Will Make Up The Overall Green Bond Evalution Score



We expect that projects will be assessed in either the mitigation or adaptation category. However, in some cases, both adaptation and mitigation evaluations will be important. For example, within the green buildings sector the mitigation category would examine the environmental impact in terms of carbon, waste, and water savings in order to establish its relative greenness compared to its peers in the sector. At the same time, the adaptation category would assess the resilience of the building to climate change risks where relevant. The location of the project would likely inform the analysis by taking into account, for example, whether it is built in an area likely to suffer from increasingly severe weather such as storms and floods. In cases where both a Mitigation and an Adaptation score would be calculated, we anticipate amalgamating those scores into a single score along with governance and transparency scores, according to a category weighting. The categories shown in chart 3 are more fully explained in the section "Green Bond Evaluation Categories" below.

Question 3

Should the Evaluation cover Adaptation?

Question 4

Do you agree that Adaptation and Mitigation, if both are relevant, can be integrated into a single score, or should the two assessments remain separate?

Scoring: A Potential Design

The overall Green Bond Evaluation is proposed to consist of a weighted average of the scores in each of the three categories of governance, transparency, and mitigation (or four categories, where adaptation is relevant as well as mitigation) shown below in table 1. Each category will score out of 100 and carry a particular weight. Final calculation: [V1W1 + X1W2 + Y1W3 + Z1W4]

Table 1

Composition Of The Green Bond Score

Category	Score (0-100)	Weight (0-100%)	Subscore (0-100)
Transparency	V1	W1	V1W1
Governance	X1	W2	X1W2
Mitigation	Y1	W3	Y1W3
Adaptation	Z1	W4	Z1W4
Final score			Sum

The weighted category scores will be combined to form the percentage score shown in the left-hand column below in table 2. These percentage scores will correspond to the grades in the right-hand column. E1 represents the highest score possible and E5 represents the lowest.

Table 2

Nomenclature Of The Final Green Bond Evaluation Score

%	Grade
80-100	E1
60-80	E2
40-60	E3
20-40	E4
0-20	E5

Question 5

What format of score would be the most useful for you in terms of tool output?

Time Frame For Responses

This consultation period, beginning on Sept. 5, 2016, and ending on Oct. 17, 2016, was established to help contribute to our development of the product in time for a currently proposed scheduled prototype launch before year-end.

Schedule of request for comment:

- Sept. 3, 2016: White paper released

- Oct. 17, 2016: Deadline to submit comments via an online platform, which can be accessed by clicking on the following link or pasting it into your browser: www.spratings.com/greenbonds .
- Week commencing Oct. 24, 2016: Webinar to discuss feedback and further steps.

Green Bond Evaluation Categories

Transparency

This category would propose to look at the reporting and management of green bond proceeds.

Reporting and disclosure. We propose to assess the clarity of reporting on use of proceeds and environmental impact for all projects and all tranches, as well as the relative quality and depth of disclosure.

Management of proceeds. We propose to assess whether there is a method employed to ring-fence or track use of proceeds in support of the stated green project(s).

Governance

This category would propose to assess certification, relevant planning and environmental procedures, risk monitoring, and risk management. While the same sub-factors would be considered across all projects and sectors, they would be tailored slightly through application of different sub-factor weighting, so as to suit the types of projects in question.

Certification. Is proposed to assess if the project is aligned with industry best practices, for example, BREEAM and LEED certificates for green buildings.

Planning and environmental procedures. Is proposed to consider whether planning procedures, such as an Environmental Impact Assessment (EIA), have been completed.

Risk monitoring. Is proposed to consider whether appropriate environmental key performance indicators (eKPIs) are in place to measure and manage environmental impact. eKPIs must be defined and quantitative, assessing, for example, a reduction in carbon emissions of X over Y years from Z% of total proceeds.

Risk management. Is proposed to consider whether systems are in place to manage environmental impact, such as an Environmental Management System (EMS), and whether this EMS is certified against a relevant industry standard, such as the International Standard for Environmental Management Systems ISO 14001.

Mitigation

This category would propose to use a net benefit approach toward assessing mitigation. A net benefit approach looks at the positive and negative impact of a particular project over its lifetime compared to a baseline scenario to determine whether the project has created a net positive or negative environmental impact overall. This category would propose to consider material stages of a project lifecycle, from the supply chain (including construction) through operations, to end of life. The operational phase is as long as the lifetime of the project or asset, and is the point at which we would consider the impact of the project compared to the baseline.

For example, a net benefit of a renewable wind energy project would consider the environmental impact of constructing and decommissioning a windfarm against the benefits of utilizing the windfarm to produce energy instead of the conventional grid in that country over the lifetime of the windfarm.

In order to net the positive and negative impact of a project, it is proposed that absolute quantities of eKPIs would be

analyzed, for example, the carbon generated versus carbon saved (tonnes CO2e). In this way, net benefit assessments can conclude that a renewable energy project delivers a net benefit to the environment over its lifetime even after considering the emissions associated with the supply chain, operation, and decommissioning.

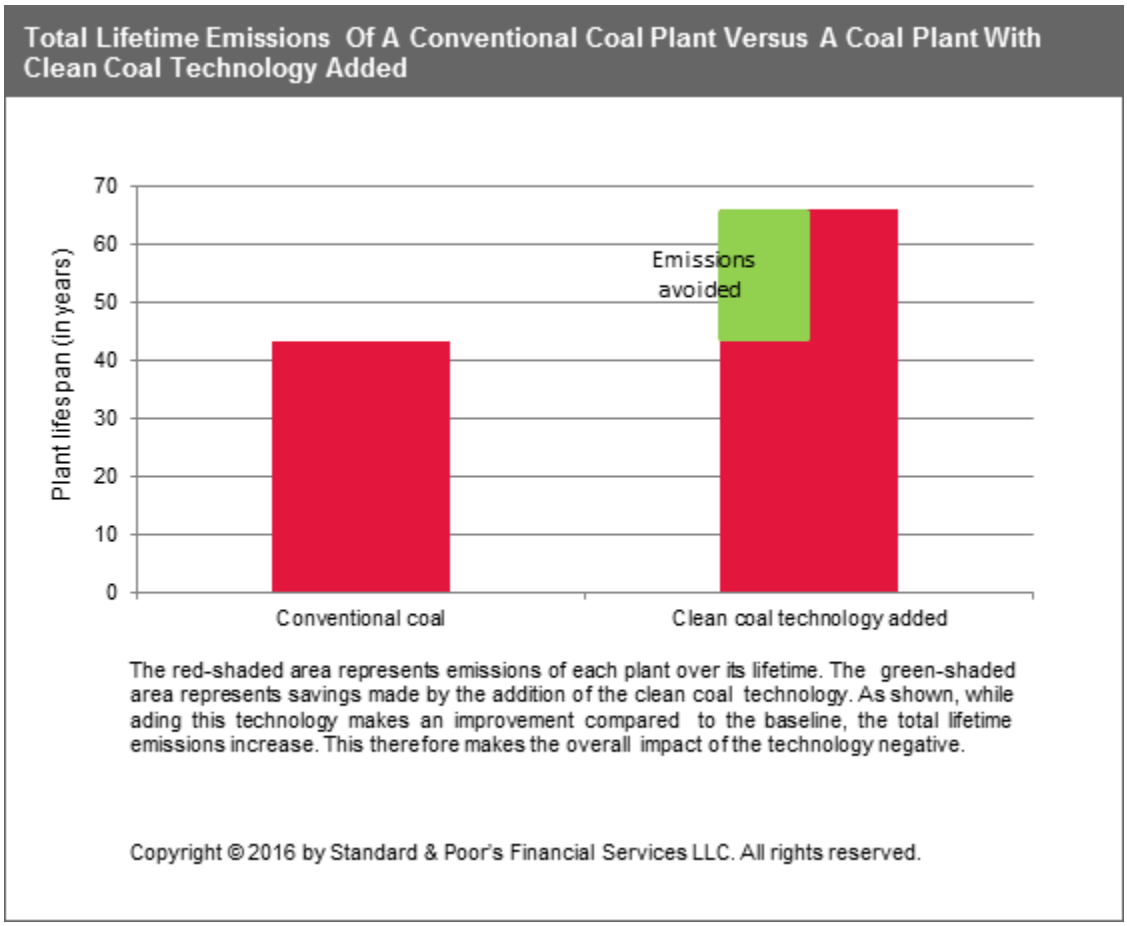
It is proposed that each eKPI would be considered separately and scored, with the final scores amalgamated into a Mitigation score using a weighting appropriate to the sector or project. For example, the eKPI most relevant to the energy efficiency sector would be carbon emissions.

Question 6

Do you agree that a net benefit approach is the most appropriate methodology?

The methodology would compare emissions savings to a baseline scenario, (for an energy project, for example, the baseline scenario would be the business-as-usual emissions rate for the grid system in the region where the project is based). Therefore, some projects, such as clean coal projects (which make the burning of coal more efficient and hence reduce emissions per MWh of energy produced), could score very well in terms of absolute quantities of carbon saved. However, in this scenario, the project would also invest in a fossil fuel energy source, and effectively extend the lifespan of the plant, therefore locking fossil fuel energy into the grid. As a result, the total emissions from the asset over its lifetime would increase. For further details, see chart 3 below.

Chart 3



The need for a sector hierarchy in mitigation

As contemplated, the net benefit methodology is proposed to assess the impact of a project over its lifetime against a baseline. As a result, a qualitative layer of analysis would be required to limit the overall Green Bond Evaluation score that projects with potentially uncaptured negative effects would be able to achieve (as illustrated in chart 3) and to differentiate between long-term green solutions and environmental impact reduction. The Green Bond Evaluation framework hence is proposing to apply, within the mitigation category, a sector level "hierarchy" as an overlay. The proposed net benefit analysis can be described as a "best in class" approach because the net benefit of a particular project is compared against a range of potential impacts within the sector in order to derive a score. For example, after applying the hierarchy, a "clean coal" project would not be able to achieve as high a score as a renewable energy project. Importantly, the hierarchy does not exclude any project type from the Evaluation.

Question 7

Do you agree that we should use a hierarchy of green technologies?

Question 8

Should certain types of project scores be capped?

The proposed hierarchy (shown in table 3) is based on a value assessment of a technology's overall contribution to a green economy, ranging from providing systemic change on top, to extending fossil fuel use at the bottom. As a result, technologies such as clean coal, which have cumulatively negative overall effects over their lifespans, are capped at the lower end of the scale, as shown in table 3.

The upper end of the scale (dark green) comprises "systemic change" projects, allowing the generation of low-carbon electricity and demand management, as this transition then feeds all the other economic sectors to allow a wider decarbonization of the economy by reducing the need for new generation.

The second level is occupied by sector-specific solutions, which are already compliant with a decarbonized, or green, economy. This includes, for instance, fully electric transport solutions or net-zero buildings. Electric transport may achieve limited environmental benefits due to the carbon content of its electricity use, but as systemic change takes place, the long-term benefits are likely to be significant.

Industrial efficiencies and energy efficiency projects come third in the proposed hierarchy, as they have significant potential for environmental benefits by lowering the impact of intensive activities. These project types are optimizing environmental impact within key sectors rather than developing low-carbon solutions. The example of an electric vehicle and a hybrid vehicle illustrates the distinction between the second and third categories.

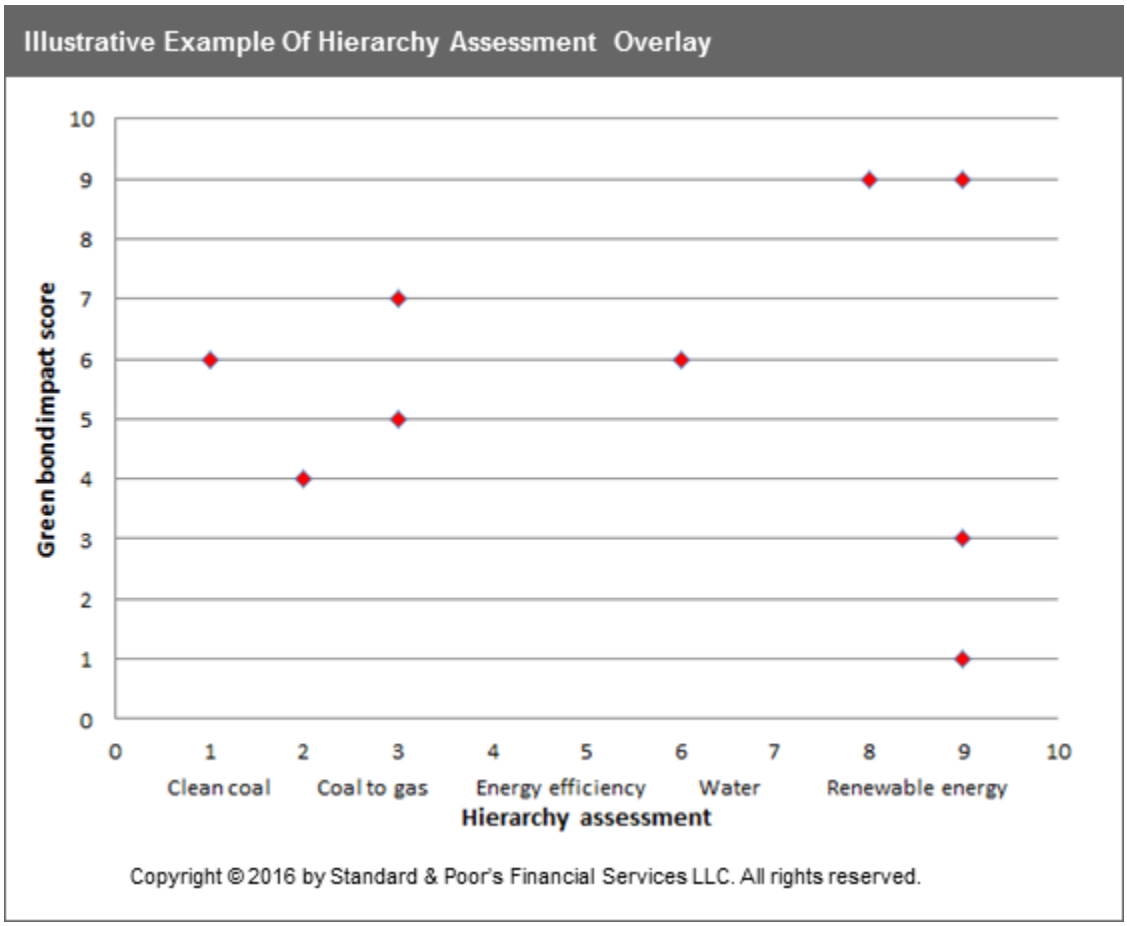
As discussed, any projects achieving environmental benefits by extending the use of fossil fuels would be proposed to be placed at the lower end of the scale. This is based on the principle that although important marginal impact mitigation can be achieved in the short term, these projects are essentially delaying the energy transition and "locking in" emissions in the long term (see Endnote 1).

Table 3

Tool Hierachy Of Green Projects	
Role in green transition	**Technology**
Systemic decarbonization of economies	Wind power
	Solar power
	Small hydro
	Large hydro
	Energy management and control
Significant decarbonization of key sectors through low-carbon solutions	Green transport apart from hybrid/fuel efficient vehicles
	Green buildings new built best standards/net zero
Decarbonization by alleviating emissions in intenstive industries	Industrial efficiencies
	Green transport (with fossil fuel combustion)
	Green buildings refurbishment/new built lower standard
	Energy-efficient products
Decarbonization technologies with significant environmental hazards	Nuclear, large hydro in tropical areas
Improvement of fossil fuel-based activities' environmental efficiency	Coal to natural gas
	Clean fuel production
	Clean use of coal

Our proposed approach is shown in chart 4 below. The vertical scale represents the net benefit score, which considers the mitigation impact of a particular project relative to its sector. The horizontal axis represents the hierarchy overlay, where the place of the sector in the hierarchy is indicated on the X-axis (renewable power is 10, coal is 1). Mitigation impact and hierarchy scores are multiplied together in order to ascertain a final green bond score out of 100, with 100 being the best score.

Chart 4



High-Level Sector Methodology For Mitigation

Renewable energy

Context. A key environmental impact of renewable energy generation is that it supplies the grid with low-carbon electricity, hence reducing the local/national carbon intensity of electricity. Indeed, it can be assumed that the electricity produced by a renewable energy power plant would have been produced by the existing power plants connected to the same grid in the event that this project had not existed. As a result, the amount of CO2 avoided by a particular renewable energy power plant is dependent on the "carbon content" of the energy connected to this grid, "netted" by the carbon costs of installing these assets. Adding renewable energy in a carbon-intensive electric system, heavily reliant on fossil fuels, will avoid more emissions as it "replaces" a very carbon-intensive electricity.

Project sub-categories:

- Solar power plant
- Hydro power plant (small/large)
- Large hydro power plant
- Wind power plant (offshore/onshore)
- Energy from waste power plant
- Green energy grid connection

Table 4

Green Energy eKPIs Considered In Net Benefit					
Carbon	Waste	Water use	Water pollution	Air pollution	Land use
X	X*	X**			

*For energy from waste power plants only.
**Only the consumptive water associated with hydropower plants will be considered (i.e. water loss through evaporation, not the total withdrawal of water). http://waterfootprint.org/media/downloads/Mekonnen-et-al-2015.pdf

Green buildings

Context. Green buildings projects aim to reduce the environmental impact of buildings over their lifespan. Buildings accounted for one-third of global carbon emissions and half of global electricity consumption in 2012. Between 2000 and 2012, the sector has seen its final energy consumption increase by 1.5% per year on average, well beyond the 0.7% required to limit the global temperature rise to no more than two degrees (2).

Green buildings target a range of environmental impacts. However, the focus remains primarily on three main eKPIs: energy efficiency, water saving, and waste reduction. Globally accepted green building certifications include BREEAM, LEED, Energy Star, Green Star, alongside many others (3).

Project sub-categories: Two key types of green buildings projects can be distinguished (4):

- Construction of new buildings.
- Retrofit of existing buildings.

Within both sub-categories are multiple asset types, including residential, retail, industrial, health care, and many more. Examples of energy-saving initiatives both in new builds and refurbishments include:

- Energy-efficient heating, ventilation, air conditioning (HVAC) systems.
- Double glazing of glass windows/walls to improve thermal insulation.
- Building Energy Management Systems (EnMS) to reduce energy use.
- Installation of onsite energy sources.

Table 5

Green Buildings eKPIs Considered In Net Benefit					
Carbon	Waste	Water use	Water pollution	Air pollution	Land use
X	X	X			

Green transport

Context. A key environmental impact of low-carbon transportation sources is to satisfy transportation demand without emitting the CO2 associated with fossil fuel combustion. Transport accounts for a large share of human-generated CO2 emissions and requires a significant evolution. For instance, the IEA estimates that the electric vehicles market has to increase at a rate of 80% per year by 2025 to be on track for a two-degree scenario. Hence, providing low-carbon transport solutions, such as electric private or public transport, is a key aspect of the energy transition and can achieve significant environmental benefits.

Projects sub-categories:

- Urban rail system.
- Electric vehicles.
- Fuel-efficient vehicles.
- Bicycle transport.
- National rail and freight systems.

Table 6

Green Transport eKPIs Considered In Net Benefit

Carbon	Waste	Water use	Water pollution	Air pollution	Land use
X	X			X	

Energy efficiency

Context. The key environmental impact of energy-efficiency projects is the ability to provide the same service while reducing energy demand (5).

Energy-efficiency projects do not constitute a separate sector, but are an integral means to achieve low-carbon transition within a range of traditional sectors, such as buildings, transportation, and industry. The scope of the savings and the techniques required depend on the sector they are applied to and location (6).

Project sub-categories: Examples of existing projects financed by green bonds and classified under the theme of energy efficiency are given below:

Table 7

Existing Projects Financed By Green Bonds

Energy efficiency projects	**Issuers**
Buildings sector	
Refurbishment of existing public buildings	EIB
LED lights retrofits	Bank of America
Thermal energy efficiency improvements of the building envelope (wall insulation, windows, roof and cellar insulation)	EIB, HERO
HVAC (High-efficiency heating, ventilation and air conditioning).	HERO
High-efficiency pool equipment	HERO

Table 7

Existing Projects Financed By Green Bonds (cont.)

Energy efficiency projects	**Issuers**
High-efficiency water heating	HERO
Windows, doors, and skylights	HERO
Pump improvement or replacement	SCA
Compressors	SCA
Consumer energy efficiency loans to homeowners to make a range of improvements to their homes, such as HVAC equipment, water heaters, roofing, insulation, windows and energy efficient appliances	Citi
Energy sector	
Smart grid/ Smart metering/ Demand-side management (DSM)	Alliander, GDF Suez, Innovatec, Fortum Varme Holding SAM
Low-carbon district heating/ Cogeneration/ Heating networks efficiency improvements	EIB, Fortum Varme Holding SAM, GDF Suez, Fortum Varme Holding SAM, Alliander
Industry	
Fans	SCA
Heat recovery from steam and refrigeration systems in factories; Energy recovery measures at production site	Unilever, Fortum Varme Holding SAM
Energy efficiency in hydropower plants	Verbund
Various	
Equipment replacement with significant energy efficiency improvements e.g. Energy Star-certified products	EIB

In effect, many of these technologies are considered within other sectors (green buildings, green energy, and green transport), leaving two main categories of projects to be considered within energy efficiency: energy efficient products (such as those with an Energy Star certification) and industrial efficiencies.

Table 8

Energy Efficiency eKPIs Considered In Net Benefit

Carbon	Waste	Water use	Water pollution	Air pollution	Land use
X					

Adaptation

We propose this category, which is an assessment of the environmental benefit of an adaptation project, would be based on the increase in resilience of the covered geographical area or asset base. The main component of our resilience assessment is proposed to be the ratio of the resilience benefit relative to the financing derived from the bond's proceeds.

We propose to calculate the resilience benefit as the reduction of the expected financial, humanitarian, and ecological

damages caused by the natural catastrophe, and the changes in weather patterns projected under climate change the infrastructure is designed to protect against over the targeted period.

To determine the resilience benefit, we would propose to review the analysis already performed by the technical advisers to the project as a part of the design of the resilience infrastructure to assess the cost-benefit of the project.

In addition, we propose this category would incorporate our view of the adequacy of the third party data and assumptions used to determine the resilience benefit.

Glossary

Water scarcity

A region is considered to be experiencing water scarcity when annual water supplies drop below 1,000 cubic meters (m3) per person (Source: United Nations).

Grid emissions factor

Measure of CO2 emissions intensity per unit of electricity generation in the grid system. (tCO2/MWh) (Source: United Nations Framework Convention on Climate Change).

Baseline

The reference scenario used to calculate the net impact of the project, for example, the tonnes of carbon avoided owing to a particular low-carbon solution. For instance, the baseline of a new power plant is the electricity currently input to the grid by the existing plants.

Construction/Implementation impact

This refers to the impact associated with the initial phase of projects, before they start achieving environmental benefits. In the case of a physical infrastructure, the impact associated with the construction phase is accounted for as construction emissions. For projects focused on technology implementation, the implementation impact accounts for the impacts associated with the deployment of the technology.

Modal split

The distribution of transportation means used by passengers, depending on city/city type. Depending on geographies, the prevalence of private cars as a means of transportation will vary, which affects the CO2 savings that can be attributed to a given public transport infrastructure. Indeed, the more carbon-intensive the initial modal split is, the more a low-carbon public transport will avoid emissions by modal shift.

Modal shift

The process by which a new supply of transportation displaces users from existing transportation means.

Smart grid

Electricity network that uses digital and other advanced technologies to minimize costs and environmental impact while maximizing system reliability, resilience, and stability (Source: International Energy Agency).

Cogeneration

Combined production instead of separate production of heat and electricity (Source: European Commission).

Endnotes

1. http://iopscience.iop.org/article/10.1088/1748-9326/9/9/094008

2. IEA Energy Transition Perspectives 2015

3. Whole Building Design Guide https://www.wbdg.org/resources/gbs.php

4. Note the CBI Taxonomy splits developments into residential and commercial due to data availability reasons.

5. Energy efficiency should be distinguished from energy conservation, which is a broader term that can also include foregoing a service, such as turning down the thermostat in the winter to save energy.

6. Napp et al., 2012. What's energy efficiency and how much can it help cut emissions? (online) Available at: https://www.theguardian.com/environment/2012/jun/08/energy-efficiency-carbon-savings