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# SPECIAL REPORT

TD Economics



November 1, 2013

## GREEN BONDS: VICTORY BONDS FOR THE ENVIRONMENT

### Highlights

- Green bonds are a debt instrument issued to raise capital that is used exclusively to support projects with specific environmental benefits. They help raise funds for environmental initiatives at a time when governments are strapped for cash. The first green bond that directed the use of proceeds was issued just six years ago. As a result, it is a relatively new financial instrument and has yet to conform to a standardized format.
- Institutional investors are the most natural client-base for green bonds. These investors hold 72% of long-term investment in the world's US\$95 trillion bond market and have demonstrated demand for environmental investment products. However, individuals are becoming increasingly exposed to green bonds, directly through portfolio diversification and indirectly through mutual funds.
- Lack of a standardized format makes estimating the size of the green bond market difficult. Market characteristics vary based on how the instrument is defined, with current estimates placing the value of the market between US\$10-346 billion. However all estimates indicate that the demand for green bonds is significant and has been growing rapidly over the past six years
- Green bonds are a good way to secure large amounts of capital to support many different environmental investments. However, they are not ideal for all types of projects, specifically high-risk ventures.
- The outlook for green bonds is very promising, but they are still subject to the same valuation analysis as any other debt instrument. In order for green bonds to attain mainstream success, their structure, rate of return and risk profile must be similar to traditional bonds.

Preserving environmental integrity, along with mitigating and adapting to the impacts of climate change will require a significant amount of global capital investment well above and far beyond current levels (see Table 1). While there is international consensus on the need to close this environmental investment gap, governments can only do so much of the heavy lifting. Indeed, fragile global economic conditions and stretched public sector balance sheets have severely limited the scope with which governments can support environmental projects.

As the risks and impacts of environmental degradation become more apparent, the world has started targeting private financing in order to narrow the investment gap. Green bonds are emerging as a front-runner to fund environmental investment and have garnered a considerable amount of attention from both investors and environmentalists. However, green bonds are still relatively new and have yet to conform to a standardized format. In this special report, we shed some light on green bonds by discussing what they are, how they are structured, and their potential role in attracting private investment for environmental initiatives.

**Table 1 - Estimates of Environmental Financing Gap**

Financing need	Capital required (US\$)
Developed to developing country flows for climate change adaption and mitigation [1]	\$100 billion/year by 2020
Water infrastructure [2]	\$800 billion/year by 2015
Halving worldwide energy-related CO2 emissions by 2050 [3]	\$300-\$400 billion from 2011-2020; Up to \$750 billion by 2030; Over \$1.6 trillion/year from 2030-2050
Clean energy investment required to keep global warming under 2°C [4]	\$500 billion/year by 2020
Investment required for energy transformation (Business as usual + additional investment) [5]	\$65 trillion by 2050 (\$1.6 trillion/year)

Source: OECD; see endnotes for respective sources.

### What is a green bond?

Green bonds are a debt instrument issued to raise capital for projects with specific environmental benefits – think of them as victory bonds for the environment. The scope of projects categorized as “green” is determined by the issuer and can be broad. At one end of the spectrum, the instrument could be tied to mitigating and adapting to the effects of climate change (sometimes called climate bonds). Alternatively, the green bond could have a narrow focus and be tied to a specific environmental issue or technology, such as solar and wind energy projects, energy retrofits and transportation (sometimes called renewable energy bonds, energy efficiency bonds and green transportation bonds).

Regardless of their label, green bonds are similar to traditional bonds, except that their proceeds are exclusively used to finance approved environmental projects. Traditional bonds issued for general corporate use can be a bit of a “black box” – investors don’t really know how the funds are being used. Green bonds, however, require transparency, as investors need to be assured that funds are being used appropriately and that the supported projects are yielding the intended environmental benefits. Issuers of green bonds usually maintain this transparency through formal monitoring and verification by auditors and environmental specialists. Monitoring can be conducted by the issuer of a bond, or a third-party.

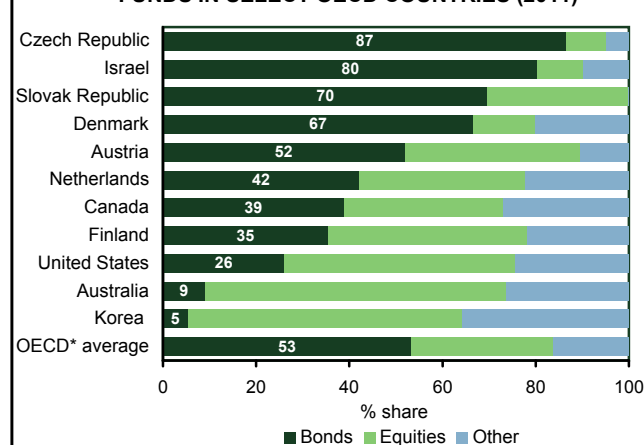
Green bonds can be issued by governments, private corporations, commercial banks and international financing institutions (e.g., the World Bank). Some of the most successful issues to date have been made by these latter institutions. In 2008, the World Bank issued its first labeled green bond and, since then, has made over 40 additional issues worth US\$4 billion. Issues by international financing institutions are popular among investors because they tend to be large Treasury-style bonds, are denominated in

benchmark currencies and have relatively low credit risk.

Green bonds issued by municipalities and private corporations have yet to obtain the same level of success, as small-issue size, higher credit risk result in bonds being deemed non-investment grade by institutional investors. To date, no Canadian municipality has issued a green bond. However, the Province of Ontario recently announced that it intends to issue green bonds in the coming year. Proceeds will be used to finance infrastructure development, such as public transportation, across the province. Furthermore, Canadian private corporations have issued slightly more than US\$5 billion of “climate bonds,” primarily in rail transportation and the renewable energy sector.

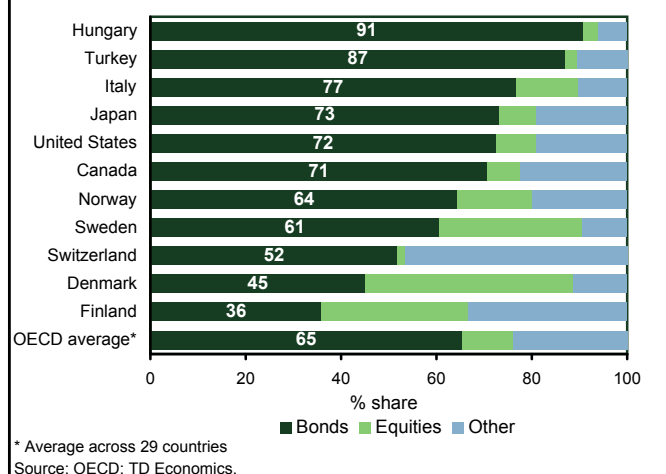
### Painting a picture of green bond investors

Institutional investors – such as pension funds, mutual funds, insurance companies and sovereign wealth funds – are the natural market for green bonds. These investors are attracted to bonds because they are long-term financial instruments. As a result, institutional investors hold about

**CHART 1 - ASSET ALLOCATION OF PENSION FUNDS IN SELECT OECD COUNTRIES (2011)**


\* Average across 29 countries  
Source: OECD; TD Economics.

**CHART 2 - ASSET ALLOCATION OF INSURANCE FUNDS IN SELECT OECD COUNTRIES (2011)**



72% of long-term investment in the global bond market, and have significant portfolio requirements for these fixed-income investments (see Chart 1 & 2).

Environmental investments have become a way for institutional investors to adhere to their mission statements and reduce risk exposure to the impacts of climate change. Some of the world's largest pension funds, such as the California State Teachers' Retirement System, have a mandate that incorporates climate risk into their asset allocation and investment strategy, as well as corporate governance voting practices. Other institutional investors have portfolio requirements for environmental investments. Denmark's ATP pension fund, for example, has dedicated US\$1 billion toward climate change investment. As the environment becomes an increasingly important part of institutional investor decision making, demand for green financial instruments will grow considerably. In fact, some

of the green bonds issued by the World Bank were designed at the request and specifications of Nordic pension funds.

Green bonds also appeal to retail investors, albeit on a much smaller scale, as individual-led investment makes up about 10% of the world's bond market. However, the role of retail investors is not to be underestimated, as they have a significant amount of indirect exposure to bonds through pension and mutual fund holdings. While these funds are not directly managed by households, as clients they can set guidelines for the institutional investors who manage their wealth.

Environmentally-conscious individuals who manage their own retirement savings, or those persons looking for long-term investments may find that green bonds give them an opportunity to support their local communities while meeting fixed income portfolio requirements and enhancing portfolio diversification. To date, retail investors have demonstrated considerable demand for green bonds. Case in point, the World Bank issued a set of green bonds with specifications tailored to households in the Japanese Uridashi bond market.

### What does the market look like?

As a financial instrument, green bonds are still in their infancy and have yet to conform to a standardized format. This makes characterizing the market difficult as the definition applied determines the market.

Current estimates of market size vary widely – anywhere from US\$10 billion all the way up to US\$346 billion. We present a few of the existing estimates here to get an idea of the size of the market. Keep in mind that each figure uses a different methodology to define what constitutes a green bond. This makes comparison across estimates difficult, as

### Text box 1 - Key players in the green bond market

**Issuers (borrowers)** – These are the institutions that issue a bond (debt) to the public with a promise to pay the value back in full, plus a rate of interest, by a certain date (maturity). Issuers use the proceeds of the bond to exclusively support environmental projects. Examples include international financing institutions, governments, private corporations and commercial banks. Think of issuers as borrowers.

**Investors (lenders)** – Investors buy the bonds of the issuer. Investors loan funds to borrowers, which is repaid with interest, at a later date. Institutional investors include pension funds, mutual funds, insurance companies and sovereign wealth funds. Households also invest in green bonds, but on a relatively smaller scale. Think of investors as lenders.

**Auditors/Verifiers** – Specialists which monitor the use of the proceeds from green bonds. Finance and accounting specialists ensure that funds are used exclusively to support environmental projects, while environmental specialists verify that projects are delivering the promised environmental benefits. Monitoring and verification of projects can be done by an external third-party or by the issuing institution if it possesses the technical capabilities and expertise.

**Table 2 - Issued Labeled Green Bonds  
(2007-2013)**

Issuing institution	# of issues	Amount issued (US\$, millions)
World Bank	46	\$3,844
European Investment Bank	12	\$3,479
International Finance Corp	8	\$2,001
Kommunalbanken AS	8	\$175
African Development Bank	7	\$838
European Bank for Reconstruction & Development	7	\$376
Asian Development Bank	6	\$794
Nordic Investment Bank	4	\$412
Export-Import Bank of Korea	1	\$500

Source: Bloomberg (data current as of October 2013); TD Economics.

they are all quantifying a different universe. Nonetheless, by analyzing these varying estimates, we arrive at some important conclusions about the market.

The first estimate pertains to debt instruments labeled as “green bonds.” Screening Bloomberg for labeled green bonds, results in US\$12 billion in bonds issued since 2007, with about US\$10 billion in funds outstanding. These bonds are primarily issued in major currencies by international financing institutions (see Table 2), with the majority of issuers having auditing and monitoring structures in place to ensure proceeds are ring-fenced and used appropriately. Labeled green bonds tend to be medium to long term investments, with most maturities falling in the 5-10 year range. Yields generally fall into the 0-3% range (see Chart 3). Moreover, the majority of green bonds have positive yield spreads relative to the respective benchmark Treasury (see Chart 4). Due to their ability to net a greater return than their primary competition, green bonds have been growing in popularity, with annual issuance increasing by 30% from 2011 to 2012. What’s more, as of October 2013, annual issues are sitting at their highest level in history (see Chart 5).

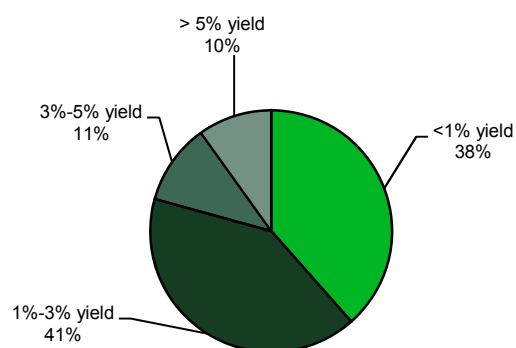
A second approximation is from The Climate Bonds Initiative (CBI) that produced a market estimate for climate bonds. Their underlying definition of a climate bond is that proceeds must align with their criteria for a low carbon, climate-resilient economy, but do not have to be specifically labeled as green bonds. The CBI estimated the green bonds market at US\$346 billion in funds outstanding, with China being the largest issuer by a wide margin (see Chart 6). The bulk of these bonds were issued to finance projects

in the transportation sector (See Chart 7). Of this US\$346 billion, US\$163 billion were deemed to be investment grade – meaning their risk, currency of issue and issue size are attractive to institutional investors. Two-thirds of investment grade climate bonds are issued by private corporations with yields between 0-3%. However, a portion of the market does offer more competitive yields in the 3-10% range (see Chart 8).

Much like labeled green bonds, climate bonds tend to be medium to long-term investments, with the majority of bonds maturing in the 5-10 year range. Climate bonds are also growing in popularity among investors, with annual issues increasing by 25% from 2011 to 2012. The CBI’s estimate of climate bonds does not require bonds to be monitored, funds to be ring-fenced, or bonds to be tied to the financing of certain projects. This is why the CBI’s estimate of the climate bond market is much larger than estimates from other institutions. As a consequence, it may somewhat overstate the size of the green bond market as per the definition given in this paper.

Using two separate definitions based on a company’s exposure to renewable energy, Bloomberg New Energy Finance estimated the size of the green bond market at US\$14 billion (narrow definition) and US\$216 billion (broad definition). According to their narrow definition, the bulk of the US\$14 billion was issued by development banks or private corporations to finance renewable energy and energy efficiency projects. No mention is made about whether a monitoring system is required. The OECD produced an estimate of their own, pegging the market at almost US\$16 billion.

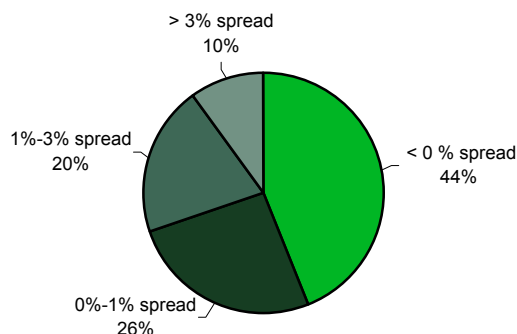
**CHART 3 - YIELD ON OUTSTANDING  
LABELED GREEN BONDS\***



\* Excluding bonds with no yield data

Source: Bloomberg, TD Economics.

**CHART 4 - YIELD SPREAD OF LABELED GREEN BONDS\* VS US TREASURY BENCHMARKS**



\* Excluding bonds with no yield data

Source: Bloomberg; HAVER Analytics; approximated by TD Economics.

Despite being unable to make direct comparisons across the different size estimates, there are some conclusions we can draw about the green bond market as a whole. The first observation is that the market for green bonds is significant and likely growing rapidly. The multiple issues and reissues by institutions suggest that both the issuers and investors are generally satisfied with green bonds as an investment vehicle. Furthermore, gains in issuance are indicative of growth in demand among investors and increased confidence in the products by issuers.

### Why invest green in the first place?

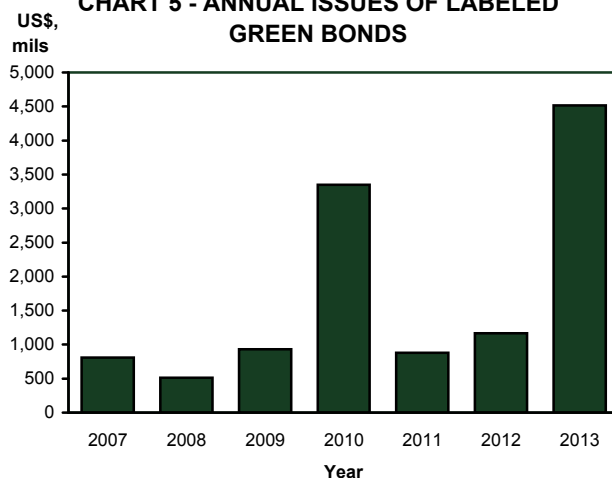
Green bonds are by no means a cure-all for closing the environmental investment gap. However, they do provide some advantages over other financial instruments. First, bonds are a good vehicle for supporting environmental investment on a large scale, especially capital intensive green infrastructure, like wind and solar energy. The bonds provide a steady stream of capital over many years, allowing projects to be launched and kept afloat before they become profitable. Second, green bonds have access to an existing market full of investors with a known appetite for bonds. The world bond market is valued at around US\$95 trillion, giving green bonds the platform and ample opportunity to capture significant amounts of capital. And, with US\$6 trillion of general bonds issued in 30,000 separate transactions in 2010 alone, there is considerable space for scaling up issuances of green bonds.

While the bond market potential is vast, it is important to keep in mind that green bonds aren't suitable for every type of environmental project, especially if institutional investors

are the primary buyer of the debt. In general, green bonds are not ideal for supporting new and unproven technologies, due to higher risk of default. Moreover, institutional investors have demonstrated little interest in bonds with returns tied to the performance of an asset (asset-backed bonds) and direct investment, due to risk, illiquidity and issues relating to technical capacity. In fact, the Organisation for Economic Co-operation and Development (OECD) has estimated that less than 1% of global pension fund assets are allocated directly to infrastructure investment. Investments into unproven markets are more suited to investors with higher risk tolerances, such as venture capitalists (see Chart 9 for an example of how the suitability of an investment vehicle changes with capital intensity and risk).

Another advantage of green bonds is that they give investors an opportunity to effortlessly integrate environmental initiatives into their portfolios. Supporting green investments can be difficult for institutional investors, as many green financial instruments have added bells and whistles, such as alternative coupon payments, liquidity constraints and variable maturities, which are hard to integrate into existing portfolio structures. Green bonds, on the other hand, can be designed with a structure identical to traditional Treasury-style bonds, which are easily included into the portfolios of institutional investors. This means green bonds can fit into existing asset structures and bolster environmental responsibility profiles without requiring additional effort on the part of the investor. What's more, green bonds have a slight competitive edge over traditional bonds, as investors faced with two bonds that are identical in characteristics – except that one is green financing – might opt for the pro-environment investment for socially-conscious reasons.

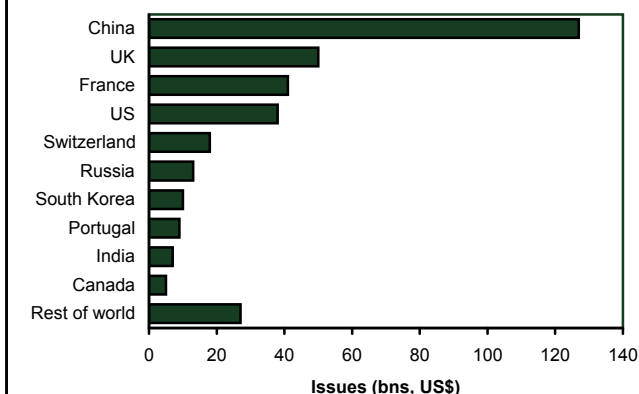
**CHART 5 - ANNUAL ISSUES OF LABELED GREEN BONDS**



Source: Bloomberg, TD Economics.



**CHART 6 - CLIMATE BONDS TOP 10 COUNTRIES OF ISSUANCE**



Source: Climate Bonds Initiative, TD Economics.

## The future of green bonds

There is tremendous room for growth in the green bond market. Private debt financing is needed for key environmental initiatives and would contribute to relaxing the fiscal constraints of governments. This could create an enormous potential for the supply of green bonds. However, every bond issued will need a buyer and markets must be able to absorb future issuance. This means the future supply of green bonds will be constrained by market demand.

Generally speaking, there is a finite amount of global savings available for investment, only a portion of which is allocated to fixed income investments. And within the fixed income market, multiple debt instruments compete for a portion of the available funds. For example, of the US\$71 trillion managed by institutional investors, only an estimated US\$7 trillion of funds is eligible for investment in long-term, fixed-income debt products. Green bonds compete with other debt instruments for a share of these funds. Although, a little bit goes a long way. The green bond market is still just 0.4% of the US\$95 trillion global bond market, even at its largest estimated value. Obtaining just 1% of the US\$7 trillion of eligible funds would increase the present green bond issuance by 20% according to the green bond market's largest estimated value and 800% according to its smallest estimated value.

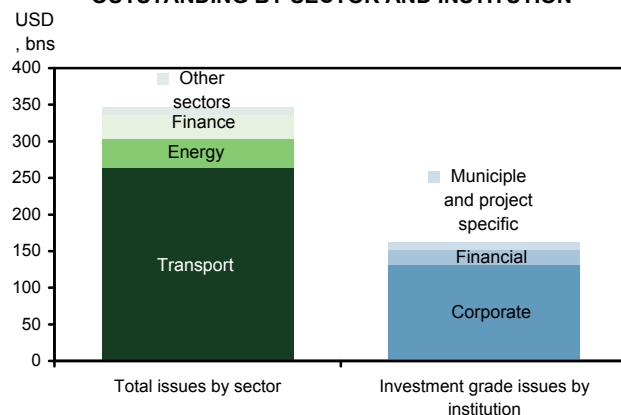
This raises the issue of what factors would permit green bonds to be competitive and increase market share. Their structure and format will play a major role in their success with mainstream investors. In order to appeal to the broadest spectrum of investors, green bonds need to be structured as close to regular bonds as possible. As we previously

mentioned, tweaking green bonds with lots of bells and whistles only makes them confusing, difficult to value, tough to fit into already well-established portfolios and are less attractive to some institutional investors. To date, the most successful issues of green bonds have been identical to the plain vanilla-style Treasury bonds that institutional investors are used to, due to their liquid nature.

Structure matters, but a competitive return on green bonds compared to other alternatives is essential. Some investors, such as corporations or governments, may be willing to sacrifice a small portion of their return to support environmental projects for socially conscious or strategic reasons. These are the investors who finance bonds with a negative yield spread (i.e. the issuer creates a debt instrument with a lower yield relative to the benchmark Treasury, see Chart 4). The issuers who have done this to date have exclusively been financing institutions, such as the World Bank. Reasons could include a social objective and/or an attempt to help the fairly new green bond market gain traction. However, in order for green bonds to gain market share, they must be designed for the majority of investors, who are primarily interested in maximizing return.

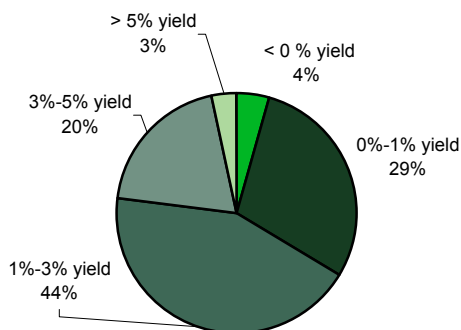
Institutional investors have a responsibility to their clients and their top priority is to maximize a stream of long-term, risk adjusted returns for their portfolios. Institutional investor industry associations, such as the Institutional Investors Group on Climate Change, have publicly stated that institutional investors are interested in supporting green investment, but are not likely to sacrifice financial returns to do so. In other words, established markets and technologies with long histories of proven returns will be favored over untested and experimental markets. At the end of the day,

**CHART 7 - ISSUES OF CLIMATE BONDS OUTSTANDING BY SECTOR AND INSTITUTION**



Source: Climate Bonds Initiative; TD Economics.

**CHART 8 - YIELDS OF OUTSTANDING INVESTMENT GRADE CLIMATE BONDS\***



\* Excluding bonds with no yield data

Source: Climate Bonds Initiative, TD Economics.

these investors need to satisfy their clients and will subject green bonds to the same valuation scrutiny as any other investment. This practice has several implications.

Some of the current popularity of green bonds has a lot to do with the higher yield they provide over government benchmark bonds in the prevailing low interest rate environment. While these low rates are expected to last for some time, they will eventually trend higher. As interest rates rise, higher yielding government bonds will become a greater competitive challenge for green bonds. Ultimately, green bond yields will need to maintain attractive spreads over government yields, but this also means that the green investments must prove profitable and viable in the higher rate environment.

Furthermore, in the medium to long term, a return towards a more normal level of interest rates is likely to prove a challenge to all fixed income investments. As rates rise, investors will begin to allocate more of their portfolios to investments which provide a greater return, such as equities. This means that competition in the fixed income market will intensify, as debt instruments will compete over a smaller pool of funds. And green bonds will have to compete across financial instruments by providing a return that is comparable and lucrative.

Similarly, it is unlikely that issuers can, in perpetuity, pass the entire costs of monitoring and verification to investors, as the practice reduces the competitiveness of the bonds. Although history of available data is short, we find that green bonds that pass monitoring and verification costs to investors result in a lower return, are received poorly, and rarely reach maximum subscription.

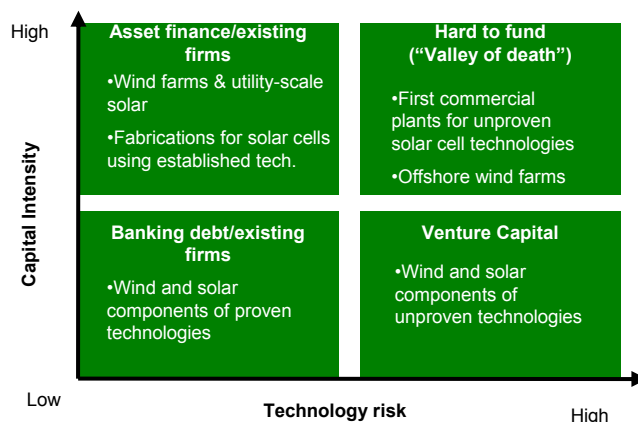
Finally, there is a challenge caused by the lack of a strong definition of the green bond market. The way the green bond market is defined impacts the types of projects supported and the ability of the instrument to narrow the environmental investment gap. Retroactively applying the green label to existing bonds can be a bit of a double-edged sword. On the one hand, it instills confidence in investors, demonstrating a pre-established market with a quantifiable history of returns, which in turn, reduces investor risk and drives demand. Some investors may even find that existing portfolios already contain a healthy portion of green investment that they were not previously aware of. On the other hand, retroactively applying the green label to existing bonds could divert investment away from new environmental projects toward a more business-as-usual scenario, resulting in “more of the same under a different name.” This would lead to a heightened risk of “green-washing” investments and reducing green bonds, more generally, to a marketing and public relations tactic.

### Bottom line

The green bond market is in its infancy, but it is showing considerable promise. There is a desperate need for funding of environmental initiatives, and the sad reality is that governments lack the financial resources to meet current and future requirements. The natural solution is to attract private sector investment into environmental initiatives, and one way to accomplish this is to issue debt instruments for environmental capital projects.

The green bond market today lacks standardization in definitions or products, making assessing its size problematic. But even using the broadest definition, the green bond market is extremely small, which suggests that there is

**CHART 9 - FINANCING BASED ON TECHNOLOGICAL RISK AND CAPITAL INTENSITY**



Source: OECD, TD Economics

great scope for growth. There is likely to be considerable appetite for green bond issuance. If green bonds are well structured and offer a competitive return, there should be strong demand for the products, particularly from institutional investors. As the green bond market matures, we expect challenges associated with definition and varied characteristics to subside. Time and maturity will only make

the asset class more attractive. One also hopes that increasing environmental consciousness will bolster issuance and demand, but structure and return will remain the key considerations for success. Investors, governments, the financial services sector and environmentalists will all continue to eagerly watch the evolution of green bonds closely, in the hopes they usher in a new era of environmental financing.

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