

SECTOR IN-DEPTH

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TABLE OF CONTENTS

Summary	1
Volume Reaches New High	2
Use of Proceeds	3
Issuance by Sector, Geography and Ratings	3
Performance of Green Bonds Index	6
Green Bond Principles Updated	6
Moody's Assigns First Time GBAs	7
Appendix: Green Bonds Issued in 2016 2Q	8
Moody's Related Research	10

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Green Bonds – Global

Record Quarterly Issuance Achieved in Q2 2016; Market Poised to Reach \$75 billion

Green bond issuance during the second quarter of 2016 reached a new quarterly high of \$20.3 billion, raising total volume to \$37.2 billion for the first half, an 89% increase over the same period a year ago. With strong issuance already observable in the first two weeks of the third quarter, the global green bond market is poised to reach \$75 billion in total volume for the year and set a new record for the fifth consecutive year. Although the first quarter was buoyed by strong issuance from Chinese-based financial institutions that accounted for almost one-half of the quarter's volume, in the latest three-month interval, issuers, sectors and countries of origin have been more diverse.

- » **The number of issuers and transactions increased, while average transaction size declined.** There were 54 distinct issuers offering a total of 81 transactions, a material increase relative to the first quarter when 31 issuers brought 56 transactions to market. Average transaction size declined during the second quarter, averaging about \$250 million per tranche.
- » **Renewable energy and energy efficiency remain projects of choice.** Almost two-thirds of second quarter green bond proceeds are once again earmarked for renewable energy and energy-efficiency projects, with approximately 61% of issuances by total dollar volume disclosing that proceeds would be allocated to these two categories.
- » **Issuance by sector more balanced in the second quarter.** Green bond issuance in the second quarter achieved a more balanced distribution across sectors. This is a reversal from the first quarter when financial institutions dominated. Also, the ABS sector experienced a 5% jump in issuance relative to the average achieved last year and accounted for 12.9% of global issuance, while the US municipal sector contributed meaningfully to second quarter volumes and helped push the US to regain its top issuer spot.
- » **Issuance also more geographically diverse.** The United States led with 22.8% of issuance, followed by the supranational and development banks at 16.7% and the Netherlands at 14.3%. By contrast, China in the first quarter of the year accounted for 46.7% of volume while the US weighed in with 19.8%.

- » **Aaa-rated transactions continue to dominate, but issuances also span the investment-grade spectrum.** Second quarter green bond transactions were, once again, largely in the investment-grade range. Based on our ratings, 97% were investment grade, and 43% were rated Aaa.
- » **Performance of broad bond market and green bonds diverge, but both continue to generate strong total returns.** The bond market in the aggregate as well as the much smaller green bond market produced strong total return results in the second quarter of 2016. But the results diverged somewhat, with green bonds generating lower quarterly returns (1.7%) than the overall market (2.5%). The divergence, we posit, may be due to the shorter weighted average life of the bonds that comprise the green bond index relative to longer-dated bonds.
- » **The Green Bond Principles are updated and expanded.** Among key changes are a broadening of the use of proceeds categories. In addition, the universe of assurance providers, now called "external reviewers," has been expanded to include a fourth category, which is a rating by qualified third parties, including rating agencies. Other changes include the expansion of the concept of "use of proceeds" to cover financing for projects with social objectives, and the launch of a new on-line based resource center.
- » **We assign first time Green Bond Assessments.** We issued three Green Bond Assessments covering three individual transactions that came to market in the second quarter and raised approximately \$1.8 billion. These included a residential mortgage backed securities (RMBS) deal as well as corporate and municipal transactions.

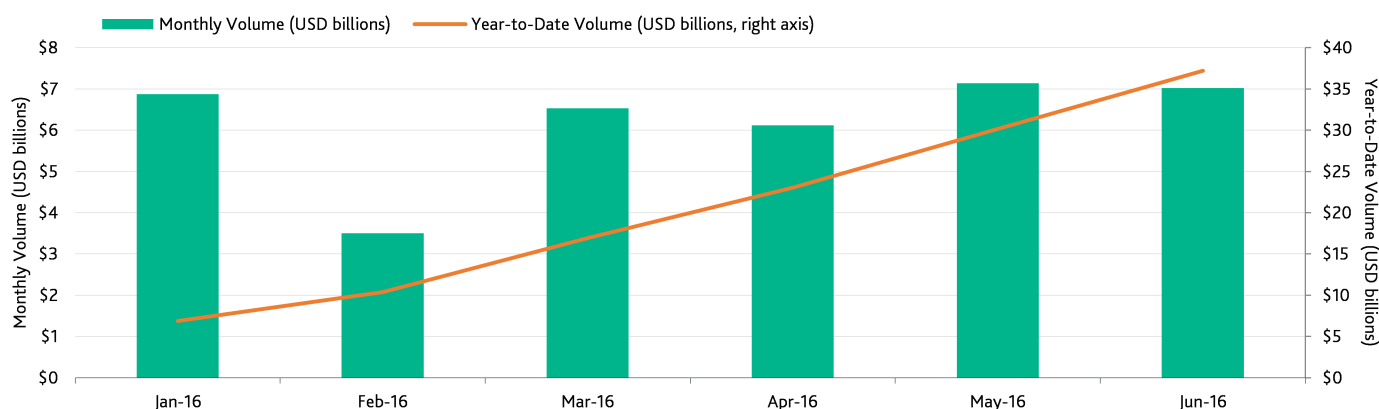
Green Bond Volume Reaches New Quarterly High

Green bond volume during the second quarter of 2016 reached a new all-time quarterly high as \$20.3 billion in green bonds reached the market. This volume pushed green bond issuance for the first six months of the year to \$37.2 billion, an increase of 89% from \$19.7 billion issued during the first half of 2015, and represents 88% of issuance registered during the entire 2015 calendar year (Exhibit 1).

With strong issuance already observable in the first two weeks or so of July, on the heels of the Bank of China's blockbuster \$3 billion green bond offered in three currencies, the global green bond market is poised to reach \$75 billion in total volume for the year and set a new record for the fifth consecutive year. Importantly transactions in the second quarter were more balanced by issuers, sectors and countries of origin.

Exhibit 1

Record Q2 Green Bond Issuance Propels Year-to-Date Volume



Source: Climate Bonds Initiative; Environmental Finance; Dealogic; Bloomberg; MSRB Electronic Municipal Market Access; various issuer websites; Moody's; OANDA currency converter.

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Number of Issuers and Transactions Increased, Average Transaction Size Declined

The second quarter saw 54 distinct issuers come to market offering a total of 81 transactions, a material increase relative to the first quarter when 31 issuers brought 56 transactions to market. Although the first quarter was largely dominated by Chinese banks, including for example Shanghai Pudong Development Bank Co. (Baa1 negative, ba1) and China Industrial Bank (A1 negative, baa2), which together floated \$6.5 billion in green bonds, the second quarter saw a greater number of market participants that were more evenly distributed across both sector and geography. Six issuers each led with bond offerings in excess of \$1 billion, topped by a six-tranche \$1.6 billion ABS offering from Toyota securitizing consumer purchases and leases of energy efficient Toyotas and Lexus vehicles. Among the other largest issuers were the European Investment Bank (EIB) (Aaa stable) at \$1.5 billion, Southern Power Company (Baa1 stable) at \$1.2 billion, Iberdrola S.A. (Baa1 positive) at \$1.1 billion, KfW (Aaa stable) at \$1.1 billion and TenneT Holding B.V. (A3 stable) also at \$1.1 billion.

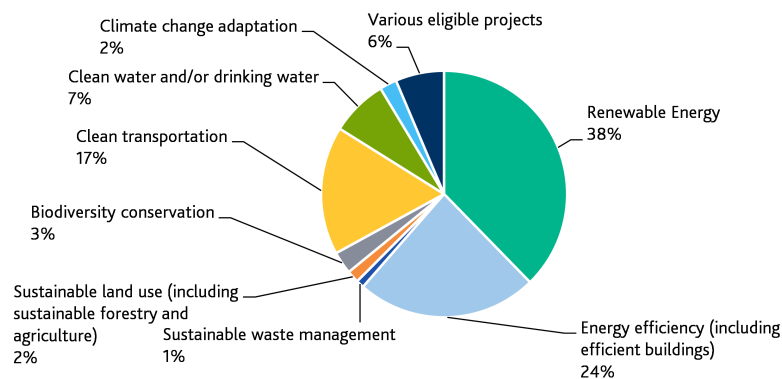
Broader issuer diversity and the increased number of transactions lowered average transaction size, which declined to \$250.3 million per tranche in the second quarter versus \$343.7 million in the first quarter. The distribution ranged from the largest \$1.6 billion Toyota deal to a \$878,000 tranche issued by the IFC.

Renewable Energy and Energy Efficiency Remain Projects of Choice

Almost two-thirds of second quarter green bond proceeds are once again earmarked for renewable energy and energy-efficiency projects, with approximately 61% of issuances by total dollar volume disclosing that proceeds would be allocated to these two categories (Exhibit 2). This distribution of projects has remained largely unchanged since Moody's began tracking the usage of proceeds in the second quarter of 2015, but project types have slowly diversified over time. Clean transportation has emerged as the third most popular use of proceeds category in the first half of the year, with 17% of use of proceeds being available for this project type in the second quarter, following a similarly strong 21% allocation in the first quarter.

Exhibit 2

Majority of Q2 Green Bond Proceeds are Earmarked for Renewable Energy or Energy Efficiency Projects



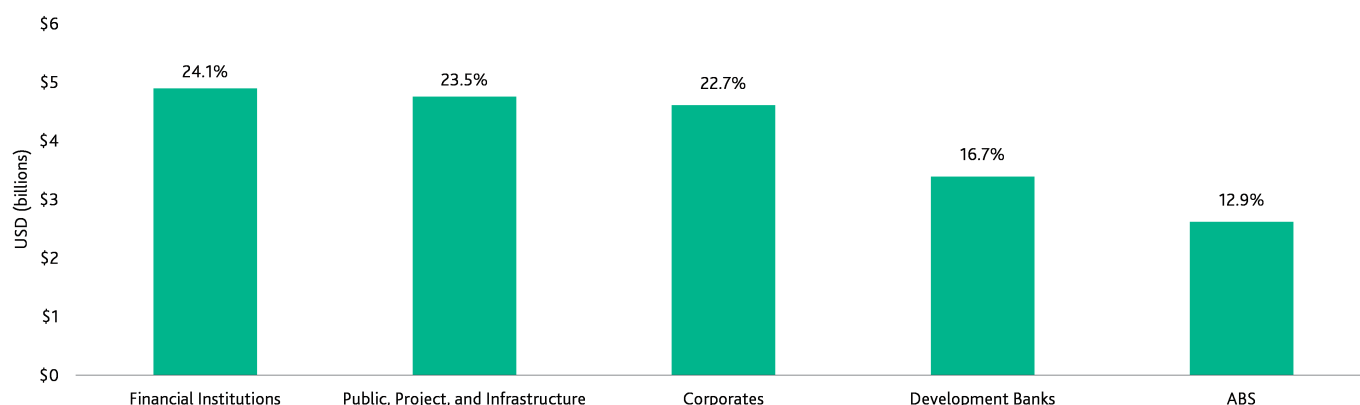
Projects qualifying under more than one eligible project category are accounted for in each of the respective project categories.

Source: Climate Bonds Initiative; Environmental Finance; Dealogic; Bloomberg; various issuer websites; Moody's; OANDA currency converter; Moody's Investors Service analysis.

Issuance by Sector More Balanced in the Second Quarter

Green bond issuance in the second quarter achieved a more balanced distribution across sectors. This was a significant departure from the first quarter when financial institutions dominated. Financial institutions marginally led the way in the second quarter with 24.1% of total volume, just ahead of public, project, and infrastructure finance issuers at 23.5% and corporate issuers at 22.7% (Exhibit 3). This was a significant reversal from the first quarter when almost 57% of issuance volume was attributable to financial institutions, driven by China-based banks issuing a combined total of \$7.5 billion. That said, financial institutions still lead with 39.2% of volume for the first half of the year, versus corporates, the second-highest issuer category at 20.5% over the first six months of the year.

Exhibit 3

Q2 Green Bonds More Balanced Across Sectors

Issuance Volume (USD billions) and Percent of Total Q2 Issuance

Source: Climate Bonds Initiative; Environmental Finance; Dealogic; Bloomberg; MSRB Electronic Municipal Market Access; various issuer websites; OANDA currency converter.

The ABS sector brought to market \$2.6 billion in green bonds, largely on the strength of a \$1.6 billion Toyota automobile securitization as well as a first of its kind energy efficient residential mortgage backed securitization in the form of a \$500 million GREEN STORM 2016 (graded GB1 by Moody's) transaction executed by Obvion, a wholly owned subsidiary of Rabobank (Aa2 stable). This pushed ABS transactions to 12.9% of global issuance in the second quarter. When combined with the \$620 million issued in the first quarter, the ABS share of global issuance year-to-date moved up to almost 9% for a 5% jump in issuance relative to 2015.

The US municipal sector contributed meaningfully to second quarter volumes, especially in pushing the US to regain its top issuer spot. Thirteen municipal entities came to market in the second quarter with \$2.6 billion in green bonds that accounted for 56.2% of total US issuance. The four largest issuers included state-wide entities in Massachusetts, New York, California and Maryland that were responsible for 76% of the volume (Exhibit 4).

Exhibit 4

U.S. Municipal Green Bond Issuers: Second Quarter 2016

Issuer	\$ Amount	Percent
Massachusetts Water Resources Authority	681,615,000	25.90%
New York MTA	588,305,000	22.35%
California Infrastructure and Economic Development Bank	410,735,000	15.60%
Maryland Economic Development Corporation	313,035,000	11.89%
San Francisco Public Utilities Commission	240,580,000	9.14%
Indiana Finance Authority	115,790,000	4.40%
San Diego County Water Authority	98,945,000	3.76%
Massachusetts Development Finance Agency	50,265,000	1.91%
Columbia University	50,000,000	1.90%
City of Cleveland, OH	32,390,000	1.23%
New Jersey Environmental Infrastructure Trust	23,925,000	0.91%
Rhode Island Infrastructure Bank	18,790,000	0.71%
City of St. Paul, MN	7,715,000	0.29%

Source: Moody's Investors Service; MSRB Electronic Municipal Market Access

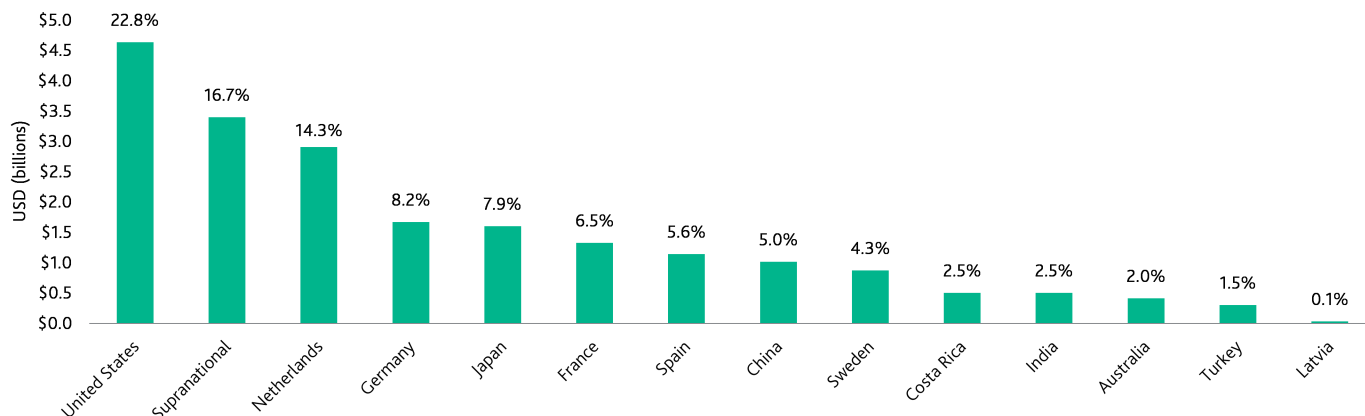
Issuance Also More Geographically Diverse

Global green bonds also exhibited greater geographic diversity in the second quarter. After green bonds from Chinese issuers accounted for nearly half of the volume in the first quarter, the US led the way with 22.8% of issuance, followed by the supranational development banks at 16.7% and the Netherlands at 14.3% (Exhibit 5). Issuers from eight separate countries/geographies issued at

least \$1 billion in green bonds and registered at least 5% of the total volume in the second quarter, reflecting greater geographic diversity.

Exhibit 5

Q2 Green Bond Volume More Evenly Distributed by Geography



Issuance Volume (USD billions) and Percent of Total Q2 Issuance

Source: Climate Bonds Initiative; Environmental Finance; Dealogic; Bloomberg; MSRB Electronic Municipal Market Access; various issuer websites; Moody's; OANDA currency converter.

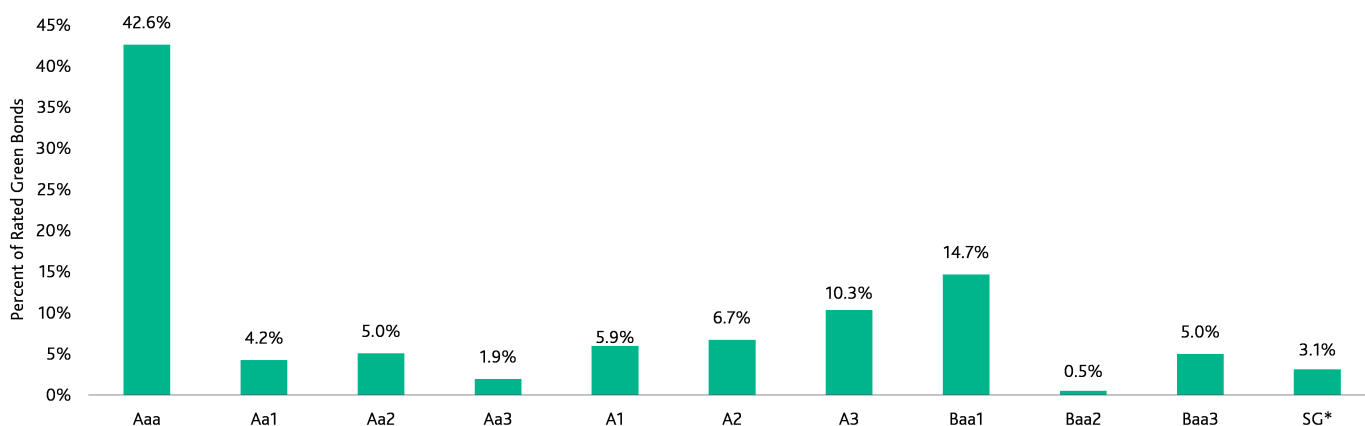
While Chinese issuance fell substantially in the second quarter to 5% of total volume from nearly half in the first quarter, the share of total green bonds from China is already slated to increase substantially in the third quarter. In just the first week of July, the Bank of China already came to market with approximately \$3 billion in green bonds consisting of three tranches in three different currencies.

Aaa-Rated Issuance Continues to Dominate, but Issuances Also Span the Investment Grade Spectrum

Second quarter green bond transactions were, once again, largely arrayed in the investment grade range. Based on our ratings, 97% were investment grade, while 43% were rated Aaa (Exhibit 6). The one speculative grade green bond was a \$500 million, Ba1-rated Banco Nacional de Costa Rica deal to finance renewable energy and clean water projects. Although recent struggles of some below-investment-grade green bond issuers may be limiting issuance from this end of the rating spectrum, the second quarter saw deals achieving ratings across the entirety of the investment-grade spectrum. For instance, 23.0% of issuance was A-rated and 20.1% was Baa-rated, compared to 14.4% and 6.5%, respectively, in the first quarter.

Exhibit 6

Q2 Moody's-Rated Green Bonds Have Broader Ratings Distribution, but Aaa-Rated Issuance Continues to Lead



*SG represents all Moody's rated below investment grade ratings. Ratings represent ratings at time of issuance. For purposes of this analysis securities or tranches carrying a P-1 short-term rating only are reflected as a long-term rating of A2.

Source: Moody's Investors Service; Climate Bonds Initiative; Environmental Finance; Dealogic; Bloomberg; MSRB Electronic Municipal Market Access; various issuer websites; Moody's; OANDA currency converter.

Transactions Subject to External Reviews Dominate in Europe

Forty-eight transactions, or 59%, based on the number of issues, relied on external reviews (refer to Green Bond Principles update) in the form of at least one second party opinion, audit, or third-party certification. This is in line with 61% of transactions in the first quarter of 2016. On a dollar basis, \$12.4 billion in bonds, or 61%, were subject to external reviews. Some transactions include more than one external review.

External review practices vary dramatically in the U.S versus Europe and Asia. In the US, only 23.9% of transactions on a dollar value basis include an external review while in Europe and Asia combined, 71.8% of transactions offer at least one form of external review.

Performance of Broad Bond Market and Green Bonds Diverge but Continue to Generate Strong Total Returns

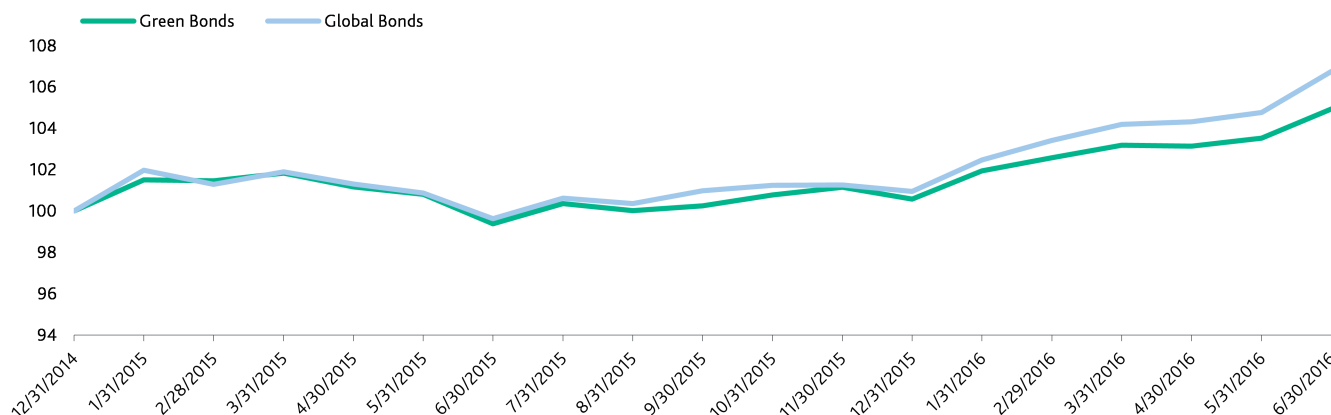
The bond market in the aggregate as well as the much smaller green bond market produced strong total return results in the second quarter and added to gains already realized in the first three months of the year. The BofA Merrill Lynch Global Bond Index ended the quarter up 2.5% on a total rate of return basis, matching the S&P 500 Index, and registering an outsized gain of 5.7% for the first half of the year. Green bonds lagged slightly with gains of 1.7% for the quarter and 4.3% for the first half of the year (Exhibit 7).

The performance of green bonds, which tracked the aggregate bond market more closely through the end of last year, has been diverging somewhat since the beginning of the year. Given their similar credit profiles, we believe that this variation in total return results may be attributable to the shorter weighted average life of the bonds that comprise the index, at 5.84 years, versus the 8.68 years for the weighted average life of the broader index. Longer-dated 10+ year bonds for example outperformed bonds maturity within 1-3 years by as much as 9.4% over the six months through June 30¹

Although index performance diverged somewhat, pricing and spreads of green bonds in the primary market continue to be aligned with equivalent non-green counterparts.

Exhibit 7

Green Bond Performance Diverges from Broad Market But Continues to Deliver Strong Returns in Quarter



BofA Merrill Lynch Green Bond and Global Bond Indices: 31 December 2014 – 30 June 2016

Source: BofA Merrill Lynch Green Bond Index (Ticker = GREN), consisting of 122 issues as of 30 June 2016, with a total of \$77.706 billion in assets. BofA Merrill Lynch Global Broad Market Index (Ticker = GBMI), consisting of 23,933 issues as of 30 March 2016, with a total of \$49.354 trillion in assets. Both indices recalibrated 31 December 2014=100, with local currency used for indexing purposes to limit the effects of currency conversion rates on bond returns.

Green Bond Principles are Updated and Expanded

The International Capital Markets Association (ICMA) on 16 June 2016 announced updates to the Green Bond Principles (GBP), a set of voluntary process-oriented guidelines applicable to green bonds. The update, which reflects the conclusion of a consultation process that involved Green Bond Principles members and observers as well as inputs from working groups established in 2015 to address key themes surfaced during the consultation process, covers four key areas as well as some additional clarifications, including:

- » The explicit categories listed under the Use of Proceeds have been expanded to nine from the previous eight and the categories now include more details.
- » The universe of assurance providers has been expanded to include a fourth category, which is a rating by qualified third parties, including rating agencies. The assurance category, which also includes second party reviews, audits and third party certifications is now referred to as an "external review," and each of the categories has been redefined. Importantly, the GBP now advocate for the public disclosure of external reviews.
- » The Green Bond Principles have expanded the concept of "use of proceeds" to encapsulate the concept of financing projects with social objectives or with a combination of social and environmental objectives. This expansion offers a framework for classifying the type of bond issued by Starbucks in early June which raised \$500 million in the form of a 10-year 2.45% sustainability bond to pay for sustainability projects, including support programs for farmers in coffee-growing regions.
- » A new internet-based resource center has been launched, with recommended templates for posting by issuers as well as external reviewers.

It should be noted that Moody's Green Bond Assessment (GBA) will not be directly affected by these updates since the GBA represents an independent approach and methodology to assessing green bonds.

Moody's Assigns first Green Bond Assessments During the Quarter

Since launching our Green Bond Assessment methodology on 30 March 2016, we have assigned three first-time Green Bond Assessments during the second quarter. Although all three transactions were originated in Europe, they vary by issuer type and include an energy-efficient residential mortgage-backed securitization, a wind energy corporate transaction, and a sub-sovereign transaction financing a portfolio of projects focused on pollution prevention and control, sustainable management, clean transportation and energy efficiency. The transactions are listed below (Exhibit 8).

Exhibit 8

First Time Green Bond Assessments Assigned by Moody's in Second Quarter 2016

Issuer	Issuer Type	Geography	Amount Issued (M)	Currency	US Dollar Equivalent (\$M)	Month of Issue	GBA	Use of Proceeds
Green Storm 2016 B.V. (Obvion)	ABS	Netherlands	500	EUR	554	Jun-16	GB1	Energy efficient residential mortgage backed loans.
TenneT Holding B.V.	Public, Project, and Infrastructure	Netherlands	1,000	EUR	1,108	Jun-16	GB1	Offshore wind transmission projects in Germany. These projects, which qualify as renewable energy/wind energy transmission.
City of Gothenburg	Public, Project, and Infrastructure	Sweden	1,000	SEK	118	Jun-16	GB1	Various projects, including climate change mitigation and adaptation and environmental or climate resiliency.

GB1 grade represents a forward looking relative opinion that the green bond issuer has adopted an excellent approach to manage, administer, allocate proceeds to and report on environmental projects financed with proceeds derived from green bond offerings. Prospects for achieving stated environmental objectives are excellent.

Source: Moody's Investors Service

Exhibit 9

Appendix: Green Bond Issues in 2016 Q2

Issuer	Amount Issued (millions)	Currency	US Dollar Equivalent (\$M)	Month of Issue
Alliander	300	EUR	342	Apr-16
BAIC Motors Corporation	2,500	CNY	386	Apr-16
Banco Nacional de Costa Rica	500	USD	500	Apr-16
California Infrastructure and Economic Development Bank	411	USD	411	Apr-16
Century Concord Wind Power	200	CNY	31	Apr-16
City of Cleveland, OH	32	USD	32	Apr-16
City of St. Paul, MN	8	USD	8	Apr-16
Columbia University	50	USD	50	Apr-16
EIB	1,500	USD	1,500	Apr-16
Flexi Trust	50	AUD	38	Apr-16
FrieslandCampina	300	EUR	342	Apr-16
Iberdrola	1,000	EUR	1,140	Apr-16
IFC	700	USD	700	Apr-16
IFC	500	MXN	29	Apr-16
IFC	2	USD	2	Apr-16
Indiana Finance Authority	63	USD	63	Apr-16
Indiana Finance Authority	53	USD	53	Apr-16
Latvenergo	25	EUR	29	Apr-16
OPIC	26	USD	26	Apr-16
Rikshem	250	SEK	31	Apr-16
Vasakronan	550	SEK	68	Apr-16
World Bank	300	INR	5	Apr-16
World Bank	280	USD	280	Apr-16
World Bank	50	USD	50	Apr-16
ABN AMRO Bank	500	EUR	556	May-16
Axis Bank	500	USD	500	May-16
Fabege	600	SEK	72	May-16
Fonciere des Regions	500	EUR	556	May-16
IFC	3	TRY	1	May-16
KfW	1,000	EUR	1,112	May-16
LTC GB Ltd	400	USD	400	May-16
Massachusetts Water Resources Authority	681.6	USD	681.6	May-16
MTA	413	USD	413	May-16
MTA	175	USD	175	May-16
New Jersey Environmental Infrastructure Trust	24	USD	24	May-16
NIB	500	SEK	60	May-16
San Francisco Public Utilities Commission	240.6	USD	240.6	May-16
Stockholm Lans Landsting	1,500	SEK	180	May-16
Toyota	490	USD	490	May-16
Toyota	446	USD	446	May-16

Issuer	Amount Issued (millions)	Currency	US Dollar Equivalent (\$M)	Month of Issue
Toyota	361	USD	361	May-16
Toyota	134	USD	134	May-16
Toyota	129	USD	129	May-16
Toyota	40	USD	40	May-16
TSKB	300	USD	300	May-16
Wallenstam	400	SEK	48	May-16
World Bank	835	INR	12	May-16
World Bank	300	INR	4	May-16
World Bank	5	USD	5	May-16
Xinjiang Goldwind	1,000	CNY	152	May-16
Zhejiang Jiahua Energy Chemical Industry Co Ltd	300	CNY	46	May-16
City of Gothenburg	1,000	SEK	118	Jun-16
Credit Agricole CIB	64	AUD	48	Jun-16
Deutsche Kreditbank	500	EUR	554	Jun-16
EBRD	130,000	IDR	10	Jun-16
Green Storm 2016 B.V.	500	EUR	554	Jun-16
Ile de France	650	EUR	720	Jun-16
Maryland Economic Development Corporation	162	USD	162	Jun-16
Maryland Economic Development Corporation	100	USD	100	Jun-16
Maryland Economic Development Corporation	27	USD	27	Jun-16
Maryland Economic Development Corporation	23	USD	23	Jun-16
Massachusetts Development Finance Agency	50	USD	50	Jun-16
NIB	500	EUR	554	Jun-16
OPIC	30	USD	30	Jun-16
OPIC	15	USD	15	Jun-16
Renew Financial	123	USD	123	Jun-16
Renovate America	305	USD	305	Jun-16
Rhode Island Infrastructure Bank	19	USD	19	Jun-16
San Diego County Water Authority	99	USD	99	Jun-16
SBAB Bank	2,000	SEK	235	Jun-16
Södra Skogsägarna	1,000	SEK	118	Jun-16
Southern Power Company	600	EUR	665	Jun-16
Southern Power Company	500	EUR	554	Jun-16
TenneT Holdings	500	EUR	554	Jun-16
TenneT Holdings	500	EUR	554	Jun-16
Westar Energy, Inc.	350	USD	350	Jun-16
Westpac Bank	500	AUD	371	Jun-16
World Bank	263	INR	4	Jun-16
World Bank	200	INR	3	Jun-16
World Bank	140	INR	2	Jun-16
World Bank	100	USD	100	Jun-16

Source: Climate Bonds Initiative; Environmental Finance; Dealogic; Bloomberg; MSRB Electronic Municipal Market Access; various issuer websites; Moody's Investors Service; OANDA currency converter

Moody's Related Research

Methodology

- » [Green Bonds Assessment \(GBA\)](#), March 2016 (188333)

Issuer In-Depth

- » [TenneT Holding B.V.: Green Bond Assessment](#), July 2016 (1030918)
- » [GREEN STORM 2016 B.V.: Green Bond Assessment](#), June 2016 (1029482)

Sector In-Depth

- » [Environmental Risks: Risks and Opportunities: What the Paris Agreement Means for Capital Markets](#), July 2016 (1033890)
- » [Environmental Risks: Moody's To Analyse Carbon Transition Risk Based On Emissions Reduction Scenario Consistent with Paris Agreement](#), June 2016 (1029574)
- » [Green Bonds - Global: Green Bonds Assessment \(GBA\)-Summary of Responses to Request for Comment](#), April 2016 (1022002)
- » [Green Bonds - Global: China Bonds Drive Q1 Issuance Record; Global Market Set for New Full-Year High](#), April 2016 (1023944)
- » [Green Bonds - US: Survey of Municipal Issuers: Disclosure Practices Differ Widely](#), April 2016 (1024182)
- » [Environmental Risks and Developments: FSB Task Force Could Begin to Clear Fog on Climate Risk Disclosures](#), April 2016 (1022814)
- » [Green Bonds - Global: Issuance Achieves Record Volume in 2015, Could Exceed \\$50 billion in 2016](#), February 2016 (1012678)
- » [Environmental Risks and Developments: Paris Agreement Advances Adoption of Carbon Regulations; Credit Impact to Rise](#), December 2015 (1011009)
- » [Cross Sector - Global: Moody's Approach to Assessing the Credit Impacts of Environmental Risks](#), November 2015 (1010009)
- » [Environmental Risks: Heat Map Shows Wide Variations in Credit Impact Across Sectors](#), November 2015 (1009845)
- » [Environmental, Social and Governance \(ESG\) Risks - Global: Moody's Approach to Assessing ESG Risks in Ratings and Research](#), September 2015 (1007087)

Sector Comment

- » [US Green Bonds: Municipal Green Bond Issuance Set to Exceed Fourth Quarter with Early 2016 Activity](#), January 2016 (1012863)

Issuer Comment

- » [Apple's First Green Bond Includes Rigorous Voluntary Verification Guidelines](#), February 2016 (187811)

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Endnotes

¹ Analysis based on Barclays Aggregate Bond Index data.

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