

Multifamily Green Bond Impact Report

2012 – 2018



Fannie Mae®

TABLE OF CONTENTS

Introduction	3
Key Triple Bottom Line Impact from our Green Bond Issuances	4
Multifamily Green Financing Business: Our Mission	5
Driving Positive Impact Through the Triple Bottom Line	7
Fannie Mae Green Bond Issuances: Triple Bottom Line Impact	8
Environmental Impact per CUSIP: Green MBS and Green REMIC	11
From Green Mortgage Loan to Green MBS	12
From Green MBS to Green REMICs	14
Green Bond Disclosure to Investors	15
A Long-term Commitment to Green Financing	17
CICERO Second Opinion: Alignment with the Green Bond Principles	19
Fannie Mae: About Us	20
Conclusion	22
Impact Reporting Methodology	22
Disclaimer	28



Together with our partners, Fannie Mae is part of the global movement to use the power of green and sustainability principles to create better quality, more affordable, and more resilient housing.”

— JEFF HAYWARD

Nine years ago, we committed to a simple idea – to create positive change in communities across the United States by improving the energy and water efficiency of multifamily properties through mortgage financing. Today, we measure our success by the positive impact in our communities – measurable environmental, social, and financial benefits to property owners, tenants, lenders, and investors and we are excited to do more.

Through year-end 2018, we have issued \$51.7 billion in Green mortgage-backed securities (MBS) and \$6.1 billion in Green structured securities¹, attracting socially responsible investors from around the world. Innovations and unique partnerships have made the impact and the issuances possible. We created new green mortgage financing processes, taught sustainability concepts to our lender partners and borrowers, forged partnerships with industry stakeholders such as the U.S. Environmental Protection Agency (EPA), and launched the first agency Green MBS to the market.

We at Fannie Mae are proud of our leadership position. For the past two years, 2017 and 2018, Fannie Mae has been the largest issuer of

Green Bonds globally. Every year since 2015, we have received the EPA’s ENERGY STAR® Partner of the Year Award. The Center for International Climate Research (CICERO) reviewed our Green Bond framework and recognized Fannie Mae’s governance and reporting processes as a “key strength.”

This recognition, plus the positive impact of our Green issuances, energizes us daily. We will continue to partner with national and global stakeholders to address sustainability challenges, set market standards for housing and financing, and lead the transition of existing housing to a low-carbon economy. Thank you for joining us on this journey.

We firmly believe in “**Doing well by doing good!**”

Best,

Jeff Hayward
Executive Vice President and Head of Multifamily, Fannie Mae
March 6, 2019

¹Fannie Mae Multifamily Green Bond issuances through YE 2018.

KEY TRIPLE BOTTOM LINE IMPACT FROM OUR GREEN BOND ISSUANCES

Fannie Mae is committed to delivering positive Triple Bottom Line impact - environmental, social, and financial - through its Green Bond issuances. Retrofitting existing properties and building new green building certified properties helps create new jobs, cuts utility costs for property owners, families and individuals, and reduces energy and water use and greenhouse gas emissions.

Here are key projected impacts from the \$51.7 billion of Fannie Mae Green Bonds issued between 2012 and 2018:



Environmental benefits through significant energy, water and greenhouse gas emission reductions: saving an estimated 4.3 billion kilo British thermal units (kBtu) of source energy annually, 5.9 billion gallons of water annually and reducing greenhouse gas emissions by 287,000 metric tons.



Social benefits for families and individuals through reduced expenses: saving \$72 million annually for families and individuals across the U.S., equivalent to an average 10 percent on their utility bills or approximately \$145 annually.



Financial benefits for U.S. economy and owners: an estimated 170,000 jobs created or supported in the U.S. economy to build and/or retrofit over 550,000 units; and, owners projected to save nearly \$33 million annually through retrofitting their properties.

For additional projected impacts, please see the “Fannie Mae Green Bond Issuances: Triple Bottom Line Impact” section of this report.

The report represents the most recent, publicly available data on the impact of Fannie Mae Green Bond issuances over a seven-year period from 2012 to 2018.

MULTIFAMILY GREEN FINANCING BUSINESS: OUR MISSION

Nine years ago, we recognized the need in the U.S. for more environmentally sustainable, affordable, and resilient housing, and committed to a bold approach. We launched our Multifamily Green Financing Business with a mission to target positive, measurable impacts to environmental, social, and financial outcomes – also known as the “Triple Bottom Line.” To realize this mission, we created smart, innovative financing solutions that incorporated energy and water efficiency and energy-generation concepts into traditional mortgage lending, and launched new capital market executions. Today, our Green Bond issuances support the retrofitting of U.S. rental housing stock to become more energy- and water-efficient and recognizes investments in green building certifications, resulting in more affordable homes for families and individuals and more cost-effective properties for owners to operate.

The market is responding to our mission to support sustainable, affordable housing, as demonstrated by our surging Green Bond issuances. In 2018, we issued \$20.1 billion in Green Bonds and an additional \$2.6 billion in Green Real Estate Mortgage Investment Conduits (REMICs), making us the largest issuer of Green Bonds globally for the second year in a row.

With this level of issuance, we’re making green financing into far more than just a specialty product; we’re making it the new standard in multifamily lending.

What is a multifamily property?

A multifamily property has key characteristics that differentiate it from a single-family property, condominium unit, or cooperative (co-op) unit. A multifamily property generally:



has 5 or more residential units within the same property;



is owned by a commercial or institutional entity or non-profit organization, rather than a single individual;



is lived in by families and individuals who sign a 12-month lease and pay rent to the owner;



relies on the cash flow of the rental income to finance operations and access mortgage debt, rather than the income of an individual or co-owners;



includes specialty housing, such as for university students or seniors;



is located in communities across the United States from urban communities to suburban and rural;

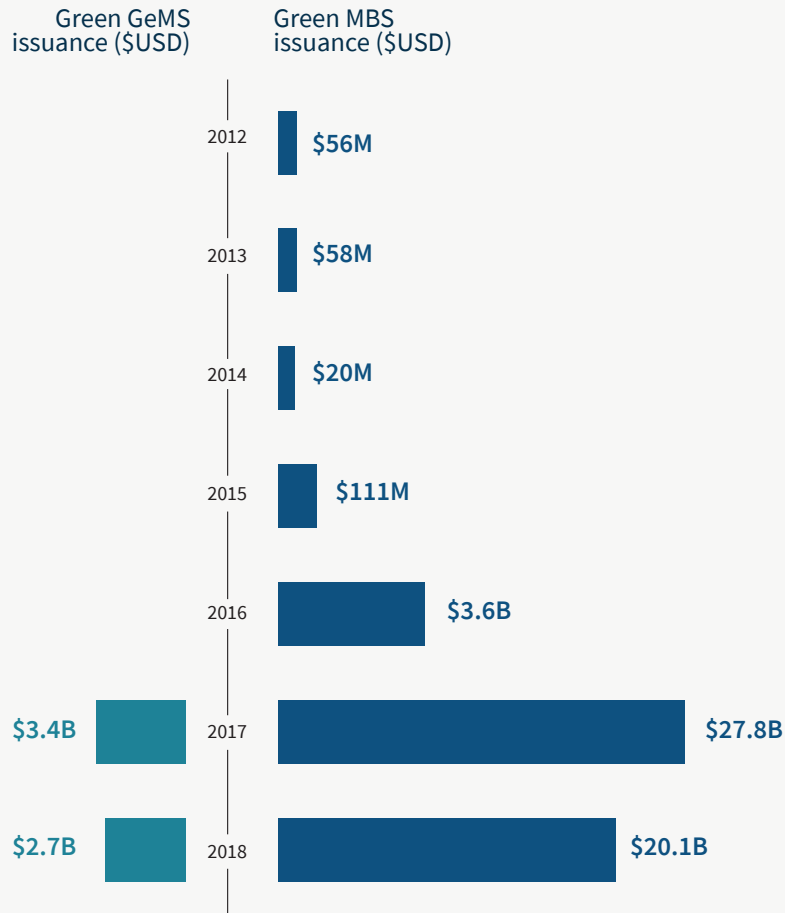


may be called workforce housing when renters pay a reasonable amount of their income toward rent; and



may be called affordable housing when there is a federal, state, or local subsidy or tax incentive, but it is not public housing or social housing.

Fannie Mae Green Bonds: Green MBS and Green GeMS™ Issuances 2012-2018^{2,3}

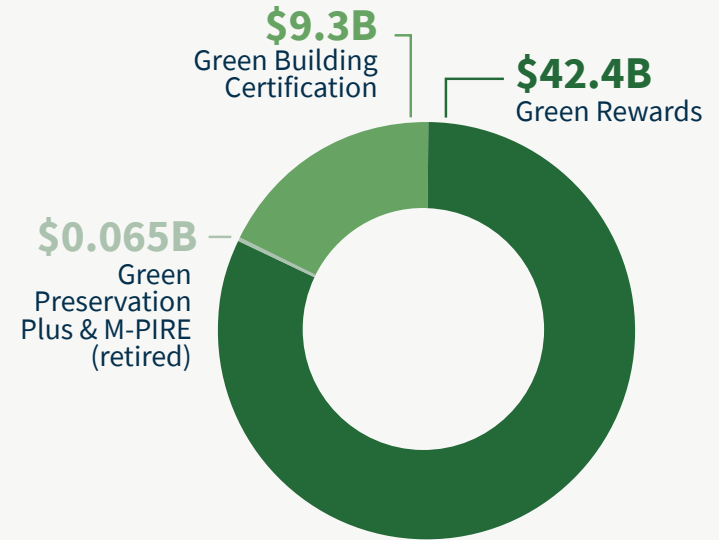


Guaranteed Multifamily Structures (GeMS™) are a re-securitization of a pool of DUS® MBS into a Real Estate Mortgage Investment Conduit (REMIC) structured product.

²Fannie Mae Multifamily Green Bond issuances through YE 2018.

³Fannie Mae included Green Preservation Plus and M-PIRE loans in issuances total. The 2015 volumes exclude a \$136 million Green Bond Credit Enhancement transaction.

Fannie Mae Green MBS Issuances by Green Mortgage Loan Product 2012-2018^{2,3}



Green Rewards and Green Building Certification Green MBS support the multifamily housing market by providing financing to retrofit properties to become more energy- or water-efficient or to support properties with a Green Building Certification. The Green Rewards Green MBS is a larger share of our issuances because of our focus on supporting the transition of existing U.S. rental housing stock to a low-carbon economy through investment in energy and water efficiency retrofits and renewable energy generation. Fannie Mae retired two loan mortgage products, Green Preservation Plus in 2018 and M-PIRE in 2015. Their volume is included to provide an accurate representation of the issuance total.³

DRIVING POSITIVE IMPACT THROUGH THE TRIPLE BOTTOM LINE

At Fannie Mae, we recognize that focusing on the benefits of the Triple Bottom Line – environmental, social and financial – of multifamily housing has the potential to provide positive impact for everyone: from families and individuals who rent the unit, to borrowers who own the unit, to our lenders who finance the unit, and the bond investors who purchase our securities. Existing multifamily properties have meaningful opportunities to improve efficiency, having 34 percent fewer energy efficiency features than found in other types of housing.⁴ As a result, owners and tenants have higher utility expenses, and properties are using more energy and water than necessary to operate.



Environmental Impact

Buildings have a substantial impact on the environment, primarily through energy and water use to operate the property throughout its life. In the U.S., almost 20 percent of carbon dioxide (CO₂) emissions from energy consumption come from residential property operations,⁵ making energy efficiency improvements and onsite renewable energy generation at multifamily properties critical tools to reduce greenhouse gas emissions. In addition, with at least 40 U.S. states anticipating a water shortage by 2024 according to the EPA⁶, improving water efficiency of multifamily buildings is increasingly necessary. Whether a property was built 10 years or 100 years ago, most multifamily properties have the potential to reduce water and energy consumption by 20 percent to 40 percent.⁷ When improvements are made to inefficient, dated systems, the result is housing that uses less energy and water, thus reducing the impact of multifamily properties on the environment.



Social Impact

Utility costs outpace inflation, rising over 50 percent in the last decade according to the Joint Center for Housing Studies at Harvard University.⁸ Green Financing and Green Bonds positively impact tenants' quality of life by making existing housing stock healthier and more affordable. Updates like better lighting and more efficient heating and cooling equipment can increase comfort and indoor air quality, while also lowering utility costs for families and individuals. Lower costs are crucial when considering that energy and water bills account for a substantial share of the cost of living in rental housing, especially among low-income tenants; one study found that low-income households spend a median of 7.2 percent of their total income on energy bills annually, more than twice what the median household spends.⁹ When living in an energy- and water-efficient property, families may have more money to spend on other important needs like education, transportation, healthcare, and child care.



Financial Impact

Green Bonds create financial value for many stakeholders: investors, lenders, property owners, and tenants. The driver of this value is lower utility expenses through investment in energy and water efficiency measures and renewable energy systems. According to the U.S. Census Bureau's 2012 Rental Housing Finance Survey, multifamily property owners' expenses for energy represent about 9 percent of rent receipts¹⁰ – and that doesn't include water expenses. Reducing those expenses presents a significant opportunity to improve financial performance of the property. Additionally, energy and water efficiency measures bolster economic vitality for communities through both direct and indirect benefits, such as the creation of jobs needed to perform the retrofitting activities, manufacturing of the materials used to retrofit, and even spending within a local community by workers employed to complete green building and retrofitting activities.

⁴Pivo, G., Energy Efficiency and its Relationship to Household Income in Multifamily Rental Housing, https://www.fanniemae.com/content/fact_sheet/energy-efficiency-rental-housing.pdf

⁵U.S. Energy Information Administration, U.S. Energy-Related Carbon Dioxide Emissions, 2017 <https://www.eia.gov/environment/emissions/carbon/>

⁶U.S. Environmental Protection Agency, Water Conservation at EPA, <https://www.epa.gov/greeningepa/water-conservation-epa>

⁷Analysis of Fannie Mae Multifamily Green Bond issuances 2012-2018

⁸Joint Center for Housing Studies of Harvard University, Housing Perspectives, <http://www.jchs.harvard.edu/blog/are-renters-less-energy-efficient-than-homeowners/>

⁹Lifting the High Energy Burden in America's Largest Cities: How Energy Efficiency Can Improve Low Income and Underserved Communities, [http://energyefficiencyforall.org/sites/default/files/Lifting the High Energy Burden_0.pdf](http://energyefficiencyforall.org/sites/default/files/Lifting%20the%20High%20Energy%20Burden_0.pdf)

¹⁰Joint Center for Housing Studies of Harvard University, America's Rental Housing Research Brief, Reducing Energy Costs in Rental Housing, http://www.jchs.harvard.edu/sites/default/files/carliner_research_brief_0.pdf

FANNIE MAE GREEN BOND ISSUANCES: TRIPLE BOTTOM LINE IMPACT

Fannie Mae Green Bonds are more than just an investment vehicle: they are designed to offer significant environmental, social, and financial impact, thus delivering on our commitment to the Triple Bottom Line framework. We are constantly innovating with our partners to address the housing needs of the future. To demonstrate our progress toward this goal, Fannie Mae has estimated the projected impact of our Green Bond issuances from 2012 through 2018. See the “Impact Reporting Methodology” section of this report for the full methodology.

Because of the transparency of our securitization structure, Fannie Mae is able to provide the estimated environmental impact per Green MBS and Green REMIC CUSIP. See the “Environmental Impact per CUSIP: Green MBS” and “Environmental Impact per CUSIP: Green REMIC” sections of this report for more details.

Environmental Impact






Fannie Mae estimates the following positive environmental impact from its Green Bond issuances:

- **36 percent of water** being saved is in water-stressed areas across the U.S.
- Properties are saving annually **4.3 billion kBtu** of source energy, which is equivalent to the amount of energy used at over 34,000 American homes in one year.
- Properties are reducing greenhouse gas emissions by **287,000 metric tons**, equivalent to nearly 61,000 passenger vehicles driven for one year.
- Properties are projected to save approximately **5.9 billion gallons of water** annually, which is equivalent to the amount of water consumed annually by nearly 54,000 American families.

Source: Fannie Mae Multifamily Green Bond issuances 2012-2018

Positive environmental impacts through Fannie Mae Green Bonds

	 Projected Annual Energy Savings (kBtu)	 Projected Annual CO ₂ eq Emissions Savings (MT)	 Projected Annual Water Savings (gallons)
2012 - 2016	324M	29,339	159M
2017	2,235M	149,630	2,460M
2018	1,711M	108,064	3,258M
Total	4,270M	287,032	5,877M

Social Impact

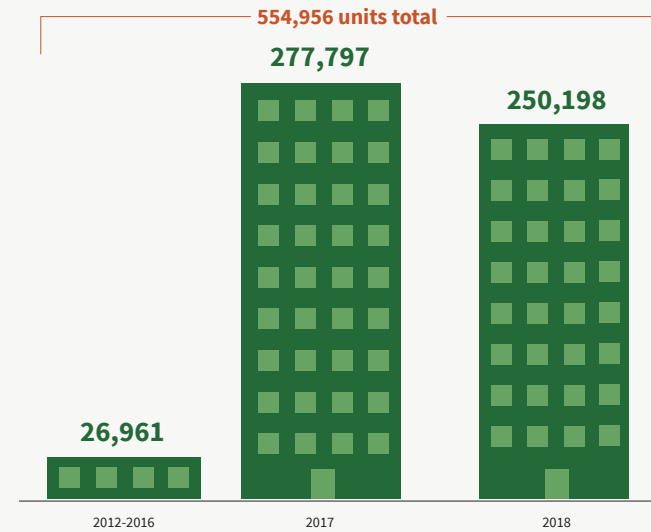


Fannie Mae estimates the following positive social impact from its Green Bond issuances:

- Families and individuals are projected to save **\$72 million annually**, equivalent to a **10 percent lower utility bill** or saving **\$145 on average per year**.
- Jobs that construct or renovate multifamily buildings with green certifications are well-paying, with annual **average earnings of \$42,000**.
- Over **550,000 units** financed by Fannie Mae have been retrofitted or have green building certifications, allowing more and more families and individuals to live in greener, healthier apartment units.

Source: Fannie Mae Multifamily Green Bond 2012-2018 issuances as estimated by Ernst & Young

More and more families are living in greener, healthier apartment units



Financial Impact

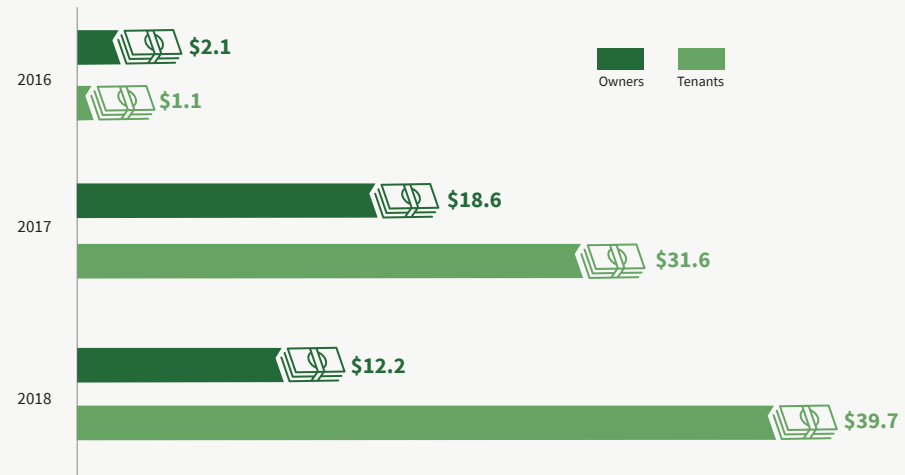


Fannie Mae estimates the following positive financial impact from its Green Bond issuances:

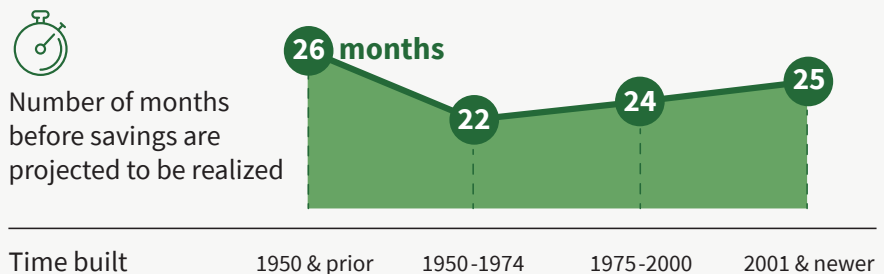
- **170,000 jobs** were created or supported to build and/or to retrofit over **550,000 units** in the Fannie Mae Green Bond issuances.
- Newly constructed and retrofitted green multifamily buildings contributed **\$7.2 billion in workers' income** and **\$14.6 billion in gross domestic product (GDP)**.
- Over seven years from 2012 to 2018, Fannie Mae borrowers committed to invest **\$208 million in energy- and water-saving capital improvements** to retrofit **over 2,000 properties**.
- For every dollar spent retrofitting properties through a Fannie Mae Green Rewards loan, **\$1.85** has been created in **economic output**.
- On average, **owners recoup investment** through their utility savings in approximately **six years**. When tenant savings are also considered, the combined cost savings **exceed investment cost within two years**, on average.
- Savings are adding up year over year: **\$105 million annually** in combined tenant and owner savings as of 2018.

Source: Fannie Mae Multifamily Green Bond 2012-2018 issuances as estimated by Ernst & Young

Projected owner and tenant savings per Green Bond issuance year



Energy and water efficiency investments are projected to have a quick payback regardless of year the property is built



Note: payback period calculation is inclusive of owner and tenant savings.

ENVIRONMENTAL IMPACT PER CUSIP: GREEN MBS

Most Fannie Mae multifamily MBS are secured by a single multifamily loan collateralized by a single multifamily property. As a result of the detailed requirements of our lending platform and our commitment to transparency, Fannie Mae is able to estimate the projected environmental impact of each Green MBS.

Fannie Mae has estimated or projected the environmental impact of our 2012-2018 Green Bond issuances according to the “Impact Reporting Methodology” section of this report.

ENVIRONMENTAL IMPACT PER CUSIP: GREEN REMIC

In addition to producing single-property, single-loan-backed MBS, our Fannie Mae multifamily business provides the opportunity for investors to pool and re-securitize their MBS into structured products, like Megs (pass-through structure) or Real Estate Mortgage Investment Conduits backed by multiple MBS. To date, Fannie Mae’s Capital Markets Desk has created the only Green MBS-backed structured product in the market. This re-securitization process does not generate new impact numbers; however, the impact of the underlying collateral Green MBS has been allocated to the Green GeMS tranches by CUSIP in order for GeMS investors to quantify the impact of their investments.

The full list of Fannie Mae’s Green Bond issuances and its impact from 2012-2018 is available on our website: www.fanniemaegreenfinancing.com

Security CUSIP	Green Financing Type	Issue Date	Issuance UPB	Projected Annual Energy Savings in kBtu	Projected Annual CO ₂ eq Emissions Savings in metric tons	Projected Annual Water Savings in gallons
314QHRPQ0	Green Rewards	12/1/18	22,125,000	783,615	40	4,606,900
314QHRQF3	Green Rewards	12/1/18	8,461,000	444,923	32	1,212,220
314QHRQ99	Green Rewards	12/1/18	21,113,000	823,305	42	2,858,000
314QHRG20	Green Rewards	12/1/18	12,889,000	1,128,263	81	1,106,280
314QHRZV4	Green Rewards	12/1/18	17,826,000	755,006	39	4,005,000
314QHR4W0	Green Building Certification	12/1/18	44,850,000	2,953,991	333	-
314QHRNB5	Green Rewards	12/1/18	15,280,000	3,316,609	190	2,480,670
314QHRZV8	Green Rewards	12/1/18	4,591,600	668,962	48	819,000
314QHRV23	Green Rewards	12/1/18	16,600,000	1,481,849	106	4,095,330
314QHRZ63	Green Rewards	12/1/18	21,080,000	980,626	70	2,717,160
314QHRG49	Green Rewards	12/1/18	51,566,000	500,851	25	1,554,800
314QHRZK0	Green Rewards	12/1/18	8,437,000	208,110	11	485,000
314QHRZY8	Green Rewards	12/1/18	5,863,000	438,236	22	1,507,810
314QHRUP7	Green Rewards	12/1/18	31,810,000	686,910	35	5,074,290
314QHRW11	Green Rewards	12/1/18	29,225,000	992,893	71	5,385,290
314QHRZG1	Green Rewards	12/1/18	32,700,000	1,992,640	143	2,959,880
314QHRZH9	Green Rewards	12/1/18	14,457,000	704,840	36	2,290,010
314QHR3N1	Green Rewards	12/1/18	8,080,000	871,814	62	1,852,760
314QHR8T6	Green Rewards	12/1/18	28,289,000	1,634,087	117	3,465,300
314QHS828	Green Rewards	12/1/18	43,220,000	981,855	50	6,728,070
314QHRJ4	Green Rewards	12/1/18	8,480,000	31,697	2	962,789
314QHS4P4	Green Rewards	12/1/18	10,910,000	1,429,456	102	3,196,290
314QHR7K3	Green Rewards	12/1/18	6,813,000	923,315	47	2,606,620
314QHS4Q4	Green Building Certification	12/1/18	1,377,000	1,539,174	173	-
314QHRZL0	Green Rewards	12/1/18	3,500,000	1,084,238	78	942,000
314QHRZH5	Green Rewards	12/1/18	3,570,000	1,380,663	94	3,447,930
314QHRJ8	Green Rewards	12/1/18	35,640,000	7,916,006	541	2,607,360
314QHRZ7	Green Rewards	12/1/18	77,641,000	1,631,609	83	5,385,290
314QHRJLJ	Green Rewards	12/1/18	17,950,000	602,163	43	1,636,410
314QHR3V0	Green Rewards	12/1/18	34,968,000	2,257,831	162	3,335,890

GeMS Deal Name	Class	CUSIP	Green Collateral Group	Class Issuance UPB	Projected Annual Energy Savings in kBtu	Projected Annual CO ₂ eq Emissions Savings in metric tons	Projected Annual Water Savings in gallons
FNA 2018-M13	A1	313683D83	Group 2	64,000,000	7,258,932	446	14,403,753
FNA 2018-M13	A2	313683D87	Group 2	532,598,608	60,407,769	3,710	119,855,916
FNA 2018-M8	A1	313682A06	Only group	30,000,000	1,282,273	79	3,353,209
FNA 2018-M8	A2	313682G04	Only group	505,197,914	21,593,395	1,338	56,467,812
FNA 2018-M4	A1	313681N05	Only group	80,000,000	7,296,837	465	10,895,449
FNA 2018-M4	A2	313681X08	Only group	625,926,099	57,091,010	3,640	85,246,828
FNA 2018-M2	A1	313680XN1	Group 1	108,540,000	8,714,673	555	10,676,140
FNA 2018-M2	A2	313680Y02	Group 1	795,954,209	63,907,137	4,067	78,291,125
FNA 2017-M15	AT51	3136AY675	Group 2	25,600,000	1,734,570	132	1,288,359
FNA 2017-M15	AT52	3136AY602	Group 2	562,357,594	38,096,687	2,899	28,296,465
FNA 2017-M15	A1	3136AY6W8	Group 3	63,350,000	1,109,234	124	241,748
FNA 2017-M15 ⁽¹⁾	A2	3136AY6X6	Group 3	495,636,706	8,631,463	973	1,891,382
FNA 2017-M13	A1	3136AY288	Group 3	63,402,000	5,068,292	310	6,908,111
FNA 2017-M13	A2	3136AY2D6	Group 3	790,656,131	56,006,746	3,428	76,941,608

FROM GREEN MORTGAGE LOAN TO GREEN MBS

For 30 years, our multifamily business has relied on the Delegated Underwriting and Servicing (DUS[®]) program to finance quality, sustainable, and affordable rental housing. In that time, Fannie Mae Multifamily has provided more than \$550 billion in liquidity to the multifamily mortgage market to finance more than 9.5 million units of rental housing.¹¹ Over 90 percent of the units we finance are affordable to families earning at or below 120 percent of the area's median income level, providing support for both affordable and workforce housing.

We have supported the U.S. housing market this way through our DUS lender network of 25 financial institutions and independent mortgage lenders. They are the salesforce for Fannie Mae's multifamily DUS loan production. The lenders underwrite loans within the Fannie Mae credit guidelines and deliver these loans to be wrapped with our guaranty. The "About Us" section of this report provides more information on our DUS network.

Fannie Mae offers a suite of Green mortgage loan products through the DUS program, including Green Rewards and Green Building Certification. These product offerings are a result of a multi-year effort to develop and test products and industry partnerships while maintaining the core credit characteristics and underwriting standards of the DUS program.

Fannie Mae's Green Mortgage Loans are originated in the same way as all our DUS production. Fannie Mae commits to acquire the Green Mortgage Loan from the DUS lender if it conforms to all of the credit underwriting requirements of the DUS program as well as the Green requirements of its particular Green financing program. The DUS lender will auction the loan to the general investor community, setting the borrower's interest rate, and Fannie Mae then securitizes

the loan into a fully-guaranteed MBS by the settlement date. The proceeds from the investor purchase of the MBS are used to fund the loan from the lender to the borrower, and the lender is then able to finance more Green multifamily properties with their balance sheet.

Once the security is issued, the investor receives the Green MBS into its portfolio. This Green DUS MBS looks just like the \$292 billion¹² DUS MBS in the market today and enjoys the same liquidity. Fannie Mae's Green MBS carry all the benefits of our traditional Fannie Mae DUS MBS while also delivering environmental, social and financial benefits.

Green Rewards Mortgage Loan

Green Rewards mortgage loans reward an owner's initiative to renovate and retrofit an existing multifamily property with capital investments in energy efficiency, water efficiency, and/or energy-generating solar technology and systems.

Eligible capital investments financed through Green Rewards may include, but are not limited to:

- Energy-efficient heating, ventilation, and air conditioning (HVAC) systems;
- Energy-efficient lighting;
- Energy-efficient appliances such as ENERGY STAR refrigerators;
- Water-efficient fixtures, including irrigation timers, low-flow toilets and faucets; and/or
- Solar photovoltaic systems.

To identify the eligible list of capital improvements, each property must undergo an ASHRAE¹³ Level 2 Energy Audit which includes an on-site visit by an energy and water assessment professional and an analysis of the prior 12 months of historical utility bills. For a loan to qualify as a Green Rewards loan, the loan must meet the eligibility

¹¹Form 10-K for the year ended December 31, 2018.

¹²Multifamily MBS outstanding as of 12/31/2018. Form 10-K for the year ended December 31, 2018.

¹³American Society of Heating, Refrigerating and Air-Conditioning Engineers.

requirements set by Fannie Mae. Fannie Mae annually evaluates the eligibility requirements for Green Rewards loans, and may modify the requirements to further support the transition of the U.S. rental housing market to a low-carbon economy.

For Green Rewards loans delivered to Fannie Mae in 2019, the property owner must commit to making capital investments that project an annual reduction for the whole property of 30 percent in a combination of energy and/or water consumption, of which a minimum of 15 percent must be attributable to savings in energy consumption through renewable energy generation and/or energy efficiency capital investments.

Green Rewards loans that were delivered in 2018 required the property owner to commit to making capital investments projected to reduce the annual whole-property (i) energy consumption by 25 percent or more through a combination of energy efficiency and energy generation measures; or (ii) water consumption by 25 percent or more. The 2018 target of 25 percent energy or water savings was an increase from the 2017 and 2016 target of 20 percent energy or water savings, representing increased positive Triple Bottom Line impact from the Green Rewards product.

Fannie Mae requires the lender to manage the use of proceeds. The Lender escrows the full cost of the selected green improvements, with the escrow being released to the borrower as the work is completed and verified by the lender. All selected improvements are documented in the loan agreement signed by the borrower, and must be completed generally within one year of loan closing. Borrowers agree to track annual energy and water usage and costs using ENERGY STAR Portfolio Manager.

Green Building Certification Mortgage Loan

Green Building Certification mortgage loans are for properties that have been awarded one of the select certifications recognized by Fannie Mae. Fannie Mae

discloses the name of the certification for Green MBS or Green REMIC collateralized by a loan on a Green Building Certification property.

Fannie Mae conducts an annual market analysis and a technical evaluation of Green Building Certifications. During this review, Fannie Mae first identifies newly available certifications or newly released revisions to previously published certification standards applicable to multifamily rental housing. Fannie Mae next conducts a technical analysis to determine whether the certification requires energy and water savings as core criteria or minimum requirements to achieving the certification and supports Triple Bottom Line outcomes. Fannie Mae also evaluates the national and international reach of the Green Building Certifications and recognition by socially responsible investors.

As a result of this annual review, Fannie Mae may change the eligible Green Building Certifications for Green Mortgage Financing over time. As of July 2018, Fannie Mae recognizes 18 certifications published by ten organizations. Fannie Mae does not recognize all certifications issued by the organizations. The most current list of accepted certifications is published on our website: www.fanniemaegreenfinancing.com

Fannie Mae supports energy- and water-efficiency through select Green Building Certifications



Green Preservation Plus Mortgage Loan

Green Preservation Plus mortgage loans incentivized owners to rehab or to retrofit existing affordable multifamily properties. To qualify as a Green Preservation Plus mortgage loan, the property owner committed to investing at least 5 percent of the loan amount in energy- and water-saving property improvements. The Green Preservation Plus program was our first Green Mortgage Loan product and arose from a partnership with the U.S. Department of Housing and Urban Development (HUD). Fannie Mae moved to a reduction in energy or water consumption target, rather than a percent of loan proceeds invested in energy and water efficiency property improvements, to determine eligibility. As a result, the Green Preservation Plus product was retired in November 2018.

Multifamily Property Improvements to Reduce Energy (M-PIRE) Loan

The M-PIRE product was piloted from 2013 to 2015 in partnership with the New York Energy Efficiency Corporation (NYCEEC). To qualify for M-PIRE, owners were required to commit to property improvements that reduced whole property energy reduction by 20 percent. Only properties in New York City were eligible for M-PIRE. Therefore, M-PIRE product was retired in 2015 when Green Rewards was launched to serve multifamily properties nationally.

FROM GREEN MBS TO GREEN REMICS

In addition to producing single-asset backed MBS, our Fannie Mae DUS business provides the opportunity for re-securitization of our MBS into structured products, like Megas (pass-through structure) or REMIC, which are backed by multiple MBS. The REMICs and Megas created from MBS owned by Fannie Mae's Multifamily Capital Markets Desk are called GeMS. Fannie Mae also issues REMICs and Megas backed by DUS MBS owned by third party investors. By structuring groups of DUS MBS into Megas or REMICs, the Capital Markets desk provides investors with the ability to invest in block-size transactions with greater geographic diversity and provides opportunities to invest in securities with different durations by time-tranching the underlying cash

flows. This re-securitization process does not generate new proceeds for the green properties backing the MBS. It instead creates better market liquidity for the MBS and provides an opportunity for socially responsible investors who are unable to invest in single-asset securities to invest in our Fannie Mae Green MBS through the REMIC structure.

Fannie Mae began re-securitizing Green MBS through its GeMS program in 2017. Since then, Fannie Mae has issued 22 securities over eight GeMS issuances that are backed exclusively by Green MBS collateral. Fannie Mae became the first issuer of Agency CMBS included in the Bloomberg Barclays MSCI Green Bond Index with the FNA 2017-M15 A2 tranche.

Fannie Mae Green REMIC Issuances 2017-2018

Issued	Deal Name	Tranches	Green Collateral Group	Green Deal Size (\$USD M)
Feb 2017	FNA 2017-M2	A1, A2	Group 2	\$611.7
Aug 2017	FNA 2017-M10	AV1, AV2	Only group	\$873.0
Nov 2017	FNA 2017-M13	A1, A2, X	Group 3	\$764.1
Dec 2017	FNA 2017-M15	ATS1, ATS2, X2 A1, A2 - included in the Bloomberg Barclays MSCI Green Bond Index	Group 2	\$587.9
			Group 3	\$559.0
Feb 2018	FNA 2018-M2	A1, A2, X	Group 1	\$904.5
Apr 2018	FNA 2018-M4	A1, A2, X	Only group	\$705.9
Jun 2018	FNA 2018-M8	A1, A2	Only group	\$535.2
Oct 2018	FNA 2018-M13	A1, A2	Group 2	\$596.6
TOTAL				\$6,137.9

GREEN BOND DISCLOSURE TO INVESTORS

As part of our standard multifamily securitization process, Fannie Mae discloses detailed information for each DUS MBS including the security, loan, and property level information on its disclosure website, DUS Disclose.¹⁴ Fannie Mae is also committed to providing energy and water performance information to investors on each Green MBS. A list of our Green MBS and GeMS is updated monthly on our website¹⁵ with pool numbers and CUSIP identifiers. As of the publication of this report, Fannie Mae disclosure includes several Green-specific data fields depending on the Green Mortgage Loan type:

- Loan Green Financing Type;
- Property Green Building Certification;
- Property ENERGY STAR score;
- Property Source Energy Use Intensity; and
- Dates applicable for the ENERGY STAR score and Source Energy Use Intensity.

With this report, we have published the following fields detailing the environmental impact per CUSIP for DUS Green MBS and Green GeMS:

- Annual projected energy savings (kBtu);
- Annual projected water savings (gallons); and
- Annual projected CO2eq emissions savings (MT).

See the “Environmental Impact per CUSIP: Green MBS” and “Environmental Impact per CUSIP: Green REMIC” sections of this report for more details. Fannie Mae continues to expand its available disclosure to investors.

¹⁴Fannie Mae DUS Disclose Website, <https://mfdusdisclose.fanniemae.com>.

¹⁵Fannie Mae Multifamily Green Financing Business Website, www.fanniemae.greenfinancing.com

The screenshot displays the Fannie Mae DUS Disclose interface for a Green MBS. The top navigation bar includes the Fannie Mae logo, 'DUS Disclose', a search bar, and links for 'Resources', 'Login', and 'Register'. The main content area is divided into several sections:

- Transaction Summary:** Shows Transaction ID AN7674, CUSIP 3138LLQ40, Product DUS, Int. Type Fixed, Status Active, Issuance UPB \$14,630,000.00, Loans 1 (1), Properties 1 (1), and Resecuritization Eligible.
- Security Timeline:** A table with columns for Issue (12/01/2017), Settlement (12/29/2017), First Payment (01/25/2018), Next Distribution (03/25/2019), and Maturity (12/01/2027).
- Security Details:**
 - Current Balance & Rate:** UPB \$14,630,000.00, Factor 1.00000000, Paying PTR 2.960% (2.960%), WA Accruing Note Rate 3.620% (3.620%).
 - Issuance:** WA Loan Term 120 months, WA Amort. Term 360 months, WA Orig. I/O Term 60 months, WA LTV 54.00%.
 - Current DSCR & Terms:** WA NCF DSCR 2.53x, WA Remaining Term 106 months.
- Loan 1717474029:**
 - Loan Seller: Capital One Multifamily Finance, LLC
 - Original UPB: \$14,630,000.00
 - Current UPB: \$14,630,000.00
 - Green Financing Type: Green Rewards
 - Lien Position: First
 - Payment Status: Current
 - Purpose: Refinance
 - Tier: Tier 4
 - Cross-Collateralized Loan(s):
 - Cross-Defaulted Loan(s):

On the right side, there is a 'Property Detail for Village Gardens' section with a 'Filter fields' dropdown and a table of property details:

Unit of Measure	Units
Property Value As of Date	10/04/2017
Tax Escrow	N
Terrorism Insurance	Y
LW Replacement Reserves	\$36,250.00
HAP Remaining Term	
ENERGY STAR® Score	43
ENERGY STAR® Score Date	10/2017
Source Energy Use Intensity	166
Source Energy Use Intensity Date	10/2017
Most Recent Debt Service Amount	\$403,089.00

The screenshot displays the Fannie Mae DUS Disclose interface for a Green MBS, focusing on environmental impact data and a map. The top navigation bar is identical to the previous screenshot. The main content area is divided into several sections:

- Transaction Summary:** Shows Transaction ID AN8787, CUSIP 3138LMMX99, Product DUS, Int. Type Fixed, Status Active, Issuance UPB \$15,920,000.00, Loans 1 (1), Properties 1 (1), and Resecuritization Eligible.
- Environmental Impact Data:**
 - Affordable Breakdown:** % of Units Set Aside for Tenants with Household Income At or Below Area Median Income.
 - Area Median Income:
 - ≤ 50%
 - ≤ 60%
 - ≤ 80%
 - Units w/Income or Rent Restrictions: Age Restricted No
 - Green Building Certification: Leadership in Energy and Environmental Design (LEED), US Green Building Council
 - Phases:
 - Year: 2015
 - Total Units per Phase Year: 50
 - Property Condition Rating:
- Map:** A map of Sacramento, California, showing the location of the property. The map includes labels for various neighborhoods and landmarks, such as Old Sacramento Historic District, Downtown, Midtown, and Alhambra Triangle.

FANNIE MAE AND U.S. EPA PARTNER TO CREATE ENERGY STAR CERTIFICATION AND ENERGY AND WATER 1 TO 100 SCORES FOR MULTIFAMILY PROPERTIES

The EPA is a United States federal agency whose mission is to protect human health and the environment.

Fannie Mae and the EPA began their partnership in 2011 to deliver meaningful tools to support energy and water efficiency at multifamily properties nationally. As a result of the partnership and additional support from HUD, Urban Land Institute, and National Multifamily Housing Council, EPA launched the ENERGY STAR score and certification for existing multifamily properties in 2014, and the Water Score in 2017.

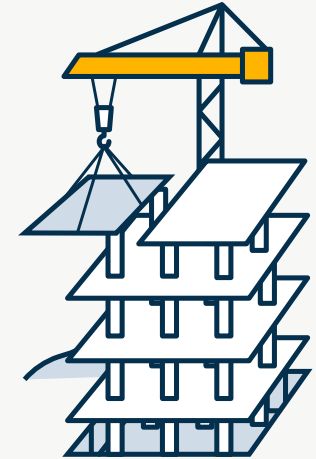
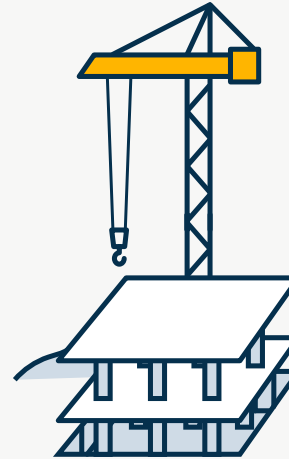
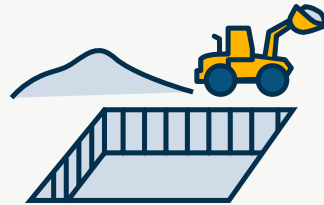
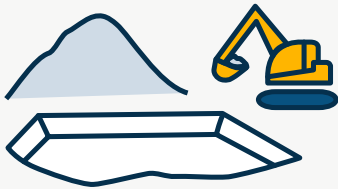
The ENERGY STAR score and the Water Score respectively measure the energy and water performance of multifamily properties in the U.S. on a 1 to 100 scale. A property with a 50 score is performing better than 50 percent of its peers, while a property with a 100 is performing better than 100 percent of its peers. The score is an important objective measurement of a property's energy and water performance, allowing owners, lenders, and investors to compare properties constructed at different times with varying materials and located in different geographies on the same 1 to 100 scale. Properties with a score of 75 or better may receive an ENERGY STAR certification.

Today, thousands of multifamily property owners across the U.S. use the ENERGY STAR Score and Water Score to track the energy and water performance of their properties and to understand how to better reduce costs and consumption. As a result of our long-term partnership and market-shaping impact, Fannie Mae was honored to be recognized as an ENERGY STAR Partner of the Year for the fourth consecutive year in 2018.



A LONG-TERM COMMITMENT TO GREEN FINANCING

Nine years ago, we committed to a bold, innovative approach to solve a challenging problem: how to transform existing, aging housing stock into better quality, more financially affordable and environmentally sustainable homes for families and individuals. This is our journey to deliver on the commitment.



2010

- Launched Multifamily Green Initiative to explore how energy and water efficiency can support quality affordable housing in the U.S.
- Hosted first Green Rental Housing Task Force, convening housing, energy efficiency, and mortgage industry experts to discuss needs and a national strategy.

2011

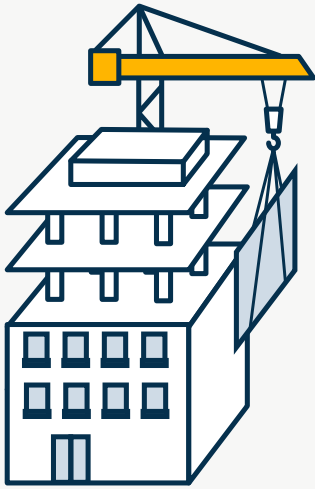
- Launched first Green Financing product, Green Preservation Plus, in partnership with HUD.
- Signed Memorandum of Understanding with EPA “to positively impact the quality and affordability of the U.S. housing inventory.”

2012

- Acquired first Green Preservation Plus loan for an Affordable property in California and issued first Green MBS.
- Acquired first Green Building Certification loan for a student housing property in Arkansas and issued as Green MBS.

2013

- Launched new Green Financing pilot product, M-PIRE, in partnership with NYCEEC.
- Developed sound methodology to underwrite projected energy and water cost savings from owners’ and tenants’ bills into a Green Mortgage loan.



2014

- Celebrated launch of EPA ENERGY STAR score for existing multifamily housing, created using nationwide data collected by Fannie Mae and its partners.
- Published “Transforming Multifamily Housing: Fannie Mae’s Green Initiative and ENERGY STAR for Multifamily” white paper, sharing key findings on multifamily energy consumption characteristics, costs, and opportunities.

2015

- Launched new Green Financing product, Green Rewards, to finance energy and water efficiency retrofits
- Created national standard for multifamily energy and water audit reports.

2016

- Acquired first Green Rewards loan for an affordable housing property in Michigan.
- Invested in extensive training of originators, underwriters, analysts and asset managers at 25 DUS lender partners on Fannie Mae Green Mortgage loans, energy and water efficiency and energy generation.

2017

- Issued first Green REMIC tranche (2017-M15 A2) backed 100 percent by loans on properties with Green Building Certifications. Issuance is listed in Bloomberg Barclays MSCI Green Bond Index.
- Celebrated launch of EPA Water Score for Multifamily Housing, the first water score for any asset class in the U.S., created using nationwide data collected by Fannie Mae and its partners.

2018

- Grew Green Bond issuances to over \$50 billion cumulative.
- Grew Green REMIC re-securitizations to over \$6 billion cumulative.
- Received Fannie Mae’s first Green Bond Second Opinion from CICERO and published on www.fanniemaegreenfinancing.com.

CICERO SECOND OPINION: ALIGNMENT WITH THE GREEN BOND PRINCIPLES

In June 2018 Fannie Mae engaged CICERO to review our Multifamily Green Bond Framework. CICERO found that the framework aligns with the International Capital Markets Association’s (ICMA) Green Bond Principles, an internationally recognized standard for green bonds. Under CICERO’s “Shades of Green” methodology, the center provided a “light” to “medium” shade for the Green Rewards program and a “light” shade for Green Building Certification. In the Second Opinion, CICERO stated:

"Fannie Mae Multifamily Green Bond Framework provides a structured, sound, and innovative approach to green financing for energy- and water-efficiency investments in the multifamily rental property market in the United States...The Framework is aligned with the recommendations laid out in the Green Bond Principles and uses established Green Building Certifications (GBCs) to inform its selection criteria for Green Mortgage Backed Securities (MBS)."

CICERO recognized Fannie Mae for:

- Well-established governance and risk management procedures;
- Internal annual review and revision by the Green Financing Business team;
- Transparent reporting procedures; and
- In-house technical expertise and tools.

CICERO’s Second Opinion can be found on our website:
www.fanniemaegreenfinancing.com.

INDUSTRY RECOGNITIONS AND AWARDS

Fannie Mae is proud to be recognized by global and national organizations for its multi-year commitment to creating greener, healthier, and more affordable housing in the U.S.

Recognition	Awarded by	Award Year
Green Bond Framework 2018	Climate Bonds Initiative	2019
Largest Overall Issuer to a Trillion Market	Climate Bonds Initiative	2018
Biggest Issuer – SSA	Environmental Finance	2018
Best ABS Issuer	GlobalCapital	2018
CMBS Deal of the Year for Fannie Mae GeMS FNA 2017-M10	GlobalCapital	2018
CMBS Issuer of the Year	GlobalCapital	2018
FNA 2017-M15 A2 included in Green Bond Index	Bloomberg Barclays MSCI	2018
ENERGY STAR Partner of the Year - Sustained Excellence	U.S. EPA	2018
ENERGY STAR Partner of the Year - Sustained Excellence	U.S. EPA	2017
ENERGY STAR Partner of the Year	U.S. EPA	2016
ENERGY STAR Partner of the Year	U.S. EPA	2015



FANNIE MAE: ABOUT US

Fannie Mae is a government-sponsored enterprise (GSE), chartered by the U.S. Congress in 1938 to support America's housing market. Our mission is to bolster the residential mortgage market by providing stability and increased liquidity and to help underserved markets, such as affordable housing options for low- and moderate-income families.

Fannie Mae supports the liquidity and stability of the U.S. mortgage market primarily through purchasing and securitizing mortgage loans originated by lenders into MBS, which we then guarantee. We operate in the secondary mortgage market in two business lines, Single-Family and Multifamily.

The Single-Family business provides financing to individuals and families for single-unit homes and properties that have four or fewer rental units. The Multifamily sector provides financing for commercially owned and operated apartment buildings with five or more rental units. Through our single family and multifamily business segments, we provided \$512 billion in liquidity to the mortgage market in 2018, which enabled the financing of approximately 3 million home purchases, refinancings or rental units.¹⁶

Since September 6, 2008, Fannie Mae has operated under the conservatorship of the Federal Housing Finance Agency (FHFA), and has subsequently entered into an agreement with the U.S. Treasury that permits us to continue to fulfill our mission.

¹⁶Form 10-K for the year ended December 31, 2018.

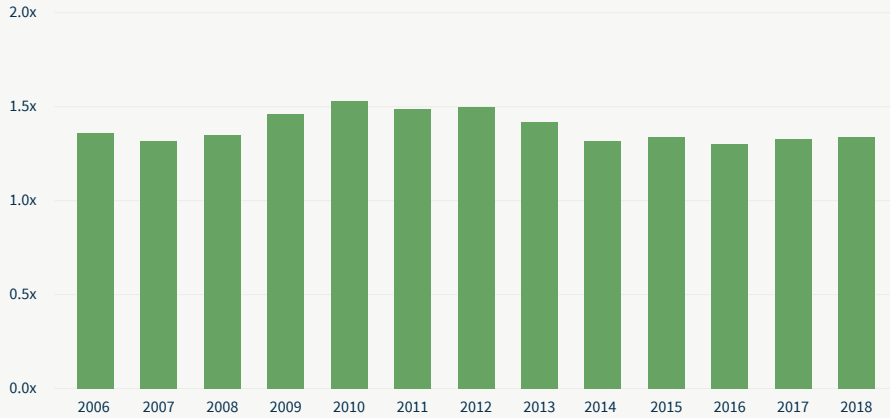
Fannie Mae Multifamily DUS Network

Our Fannie Mae Multifamily Mortgage Business operates in partnership with a network of 25 lenders. The “partner” portion of our relationship with these lenders is in the shared risk of the DUS model. Lenders retain one-third of the underlying credit risk of the loans they sell to Fannie Mae, while we retain the other two-thirds, ensuring that both parties have a stake in the performance of every loan.

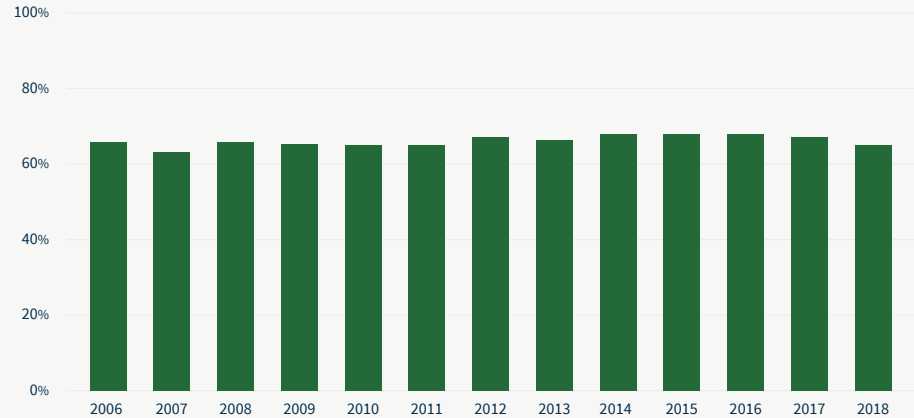
The annual average credit characteristics have remained relatively consistent over time, reflecting the strength of this partnership with our DUS lenders. Even through the worst of the 2008-2009 financial crisis, Fannie Mae’s multifamily serious delinquency rates (SDQ) peaked at 0.80 percent, compared with Commercial MBS SDQ which peaked at over 15 percent in 2010. The strength of the DUS model’s risk sharing lies in the solid credit quality of the financing that it produces and the ability of Fannie Mae to leverage private capital in creating market liquidity.

Fannie Mae Multifamily portfolio demonstrates strong, long-term credit quality

Annual Average Underwritten DSCR



Annual Average Underwritten LTV



Trusted Partners: Fannie Mae DUS Lenders

Capital One National Association			Arbor Commercial Funding	Barings Multifamily Capital	Bellwether Enterprise Real Estate Capital	Berkadia Commercial Mortgage
CBRE Multifamily Capital		Citi Community Capital	Dougherty Mortgage	Grandbridge Real Estate Capital	Greystone Servicing Corporation	HomeStreet Capital Corporation
Jones Lang LaSalle Multifamily		JPMorgan Chase & Co.	KeyBank National Association	M&T Realty Capital Corporation	Newmark Knight Frank	NorthMarq Capital
PGIM Real Estate Finance		PNC Real Estate	Regions Bank	SunTrust Bank	Walker & Dunlop	Wells Fargo Multifamily Capital
Hunt Mortgage Group						
Orix Real Estate Capital						

CONCLUSION

Nine years ago, Fannie Mae launched our journey into Green Financing, and we greatly appreciate the many partners who joined us on this journey, lending support and embracing the benefits of green, sustainable housing, and financing. Each partnership has played a vital role in our success – from investors and borrowers to our DUS lender partners and government entities. Together, we are making a difference as we seek to share knowledge and to further set industry standards for Green Mortgage Loans and Green Bonds globally. We are encouraged by the surge of interest in our offerings and gratified to be making a significant positive impact through the existing multifamily housing stock. Thank you to everyone who welcomed our Triple Bottom Line framework and is helping us continue to support sustainable, affordable housing. As we look back, we also look forward with anticipation as we continue to innovate new solutions.

IMPACT REPORTING METHODOLOGY

Introduction

This impact report is intended to estimate the positive environmental, social, and financial benefits of Fannie Mae’s Multifamily Green Bonds. This estimation is based on the comparison of the green property underlying the Green Mortgage Loan with a modeled equivalent non-green property; or, the estimation of energy, water, and cost and consumption savings projected to result from capital investments that may not yet have been completed as of the time of this report’s publication. The ex-ante quantification of the impact from each security is based on projections and estimations calibrated to industry standards.

This section details the data sources, analysis methods, and assumptions that were used to quantify the estimated impact of Fannie Mae Green Bond issuances.



Impact Report Data Set

The data set used for the Impact Report analysis comprised all Green Bonds backed by Green Mortgage Loans acquired by Fannie Mae from January 1, 2012, through December 31, 2018. Green Mortgage Loans are any loans financed with Fannie Mae’s Green Rewards, M-PIRE or Green Preservation Plus products, and any loans collateralized by properties with eligible Green Building Certifications. It excludes one green bond credit enhancement since it is not a Fannie Mae-issued security. It also excludes the impact of the seven Green Preservation Plus (GPP) loans was not quantified due to Fannie Mae moving to an energy and water consumption saving eligibility requirement. Green Preservation Plus was the first Green Mortgage Loan product introduced to the market whose eligibility requirement was based on a percent of unpaid principal balance (UPB). The sole 2014 M-PIRE loan delivered to Fannie Mae was included in the data set since the eligibility for M-PIRE was based on a consumption-savings target, rather than a percent of UPB.

Please note that there may be minor variations between the set of securities in this analysis and the full list of Green MBS that can be found on the Green Financing website or on DUS Disclose. In the course of normal business operations, data may be corrected after delivery of the loan to Fannie Mae.

Approach

For the purpose of this report, each loan’s impact was assessed as a single-year impact, not a cumulative impact for the anticipated full term of the loan. The single-year impact for Green Rewards and M-PIRE loans was based on the energy- and water-saving capital improvements selected by the borrower for implementation at the property, and those improvements’ projected annual energy and water savings over the property’s historical 12-month consumption, regardless of whether those improvements were completed by the end of 2018. The single-year impact for loans on properties with Green Building Certifications represents the estimated impact of the property’s green construction and operation as compared to a modeled equivalent non-green property. For the

economic impact metrics, the estimated impacts are reported for the year in which the loan was acquired by Fannie Mae.

Fannie Mae relied on the expert services of MKThink and Bright Power to calculate the environmental impact of the Green Bonds. Ernst & Young estimated the economic, financial and social impacts presented in this report. Impacts such as nationwide employment, personal income, GDP, and gross economic output were estimated using the IMPLAN economic model of the United States. Economic metrics presented in the report generally refer to total economic impacts which include supply-chain (indirect) and consumption-related (induced) economic effects. Unless otherwise noted, all estimates are based on nationwide averages for the relevant metrics. Ernst & Young estimated cost savings periods and selected other economic metrics using information provided by Fannie Mae, its consultants, and relevant third-party data sources as noted in this methodology.

Impact Metric Sources

Metric	Securities Backed by Green Rewards and M-PIRE Loans	Securities Backed by Loans on Properties with Green Building Certifications
Energy Consumption Reductions	High Performance Building Report Data supported by Bright Power	MKThink Environmental Impact Workbook
Greenhouse Gas Emissions Reductions	High Performance Building Report Data supported by Bright Power	MKThink Environmental Impact Workbook
Water Consumption Reductions	High Performance Building Report Data supported by Bright Power	MKThink Environmental Impact Workbook
Economic and Financial Impact	Ernst & Young analysis	Ernst & Young analysis

QUANTIFICATION OF ENVIRONMENTAL IMPACTS

Data Sources: Green Rewards and M-PIRE Loans

The primary data source for the impact analysis of Green Rewards and M-PIRE loans is Fannie Mae's High Performance Building (HPB) Report. The requirements for the HPB Report, which includes an ASHRAE Level 2 Energy Audit, are contained in Section 5.08 of Fannie Mae's Instructions for Performing a Multifamily Property Condition Assessment (PCA) (Form 4099).¹⁷

The HPB Report is prepared by a third-party consultant hired by the DUS lender. DUS lenders must select a consultant who meets the requirements identified in Form 4099. Fannie Mae has also identified a set of pre-qualified consultants who have met Fannie Mae's detailed criteria, including extensive experience in preparing energy and water audits for multifamily properties. The HPB consultants' audit process includes:

- gathering property data and historical utility consumption and cost data;
- establishing a baseline of the property's 12-month whole-property energy and water consumption;
- conducting a site visit to the property;
- energy and water modeling; and
- identifying and quantifying recommended energy- and water-saving capital investments.

HPB consultants generally recommend 10 to 20 energy- and water-saving or renewable energy-generating improvements known collectively as Energy and Water Efficiency Measures (EWEMs). EWEMs are identified specifically for each property based on the property's equipment age, energy or water inefficiency or other factors. All recommended EWEMs must be capital investments that require the installation of equipment, fixtures, or appliances. Improvements that require solely changing

operations and maintenance procedures or plans cannot be an EWEM that counts towards Green Mortgage Loan eligibility since the projected energy and water cost and consumptions savings are anticipated to be less durable than savings resulting from equipment, fixture or appliances.

For each recommended energy- or water-saving property improvement, the HPB consultant calculates an estimation of many environmental and cost metrics, including:

- implementation cost for both equipment and labor to install;
- annual projected energy and water cost savings for the borrower;
- annual projected energy and water cost savings for the tenants; and
- annual projected energy- and water-consumption savings for the property.

The baseline consumptions, recommendations for improvements, and cost and consumption savings data from the HPB consultants' analyses are input into Fannie Mae's Form 4099.H, an Excel workbook. Form 4099.H is a required part of the HPB Report, and has been developed with support from Bright Power, an independent expert energy management consulting firm.

The 4099.H calculates metrics such as:

- source energy baseline and projected savings from site energy inputs;
- projected source energy- and water-consumption savings as a percentage of the whole-property annual historical baseline usage consumption; and
- projected greenhouse gas emissions reductions using the ENERGY STAR methodology, based on the annual projected source energy consumption savings for the property as determined by the HPB consultants.

In order to calculate greenhouse gas emissions reductions, energy savings projections provided by consultants in the HPB Reports are converted from native units (kWh, therms, etc.) into source energy (in kBtu) and associated greenhouse gas emissions reductions in accordance with the ENERGY STAR Portfolio Manager

¹⁷Fannie Mae Form 4099.H, https://www.fanniemae.com/content/guide_form/4099.pdf

methodology. ENERGY STAR Portfolio Manager Technical References provide conversion factors and are updated periodically and are reflected in the 4099.H. For consistency, the conversion factors used in calculating loan impacts in this report are the same as those used in the form 4099.H for each loan. Conversion factors can be found in the ENERGY STAR Portfolio Manager Technical Reference guides entitled “Portfolio Manager Technical Reference: Greenhouse Gas Emissions”, “Portfolio Manager Technical Reference: Source Energy”, and “Portfolio Manager Technical Reference: Thermal Conversion Factors.”¹⁸ Loans which used the 4099.H before August 2018 use thermal conversion factors from the EPA Quick Converter tool.¹⁹

After the DUS lender and/or Fannie Mae thoroughly review the HPB Report for accuracy and completeness, the lender reviews the report with the borrower. From the list of energy- and/or water- saving capital investments recommended by the consultant, the borrower selects capital investments that meet or exceed the Green Rewards or M-PIRE program eligibility requirements. Fannie Mae requires that the lender escrow the full cost of all selected investments, with the escrow being released to the borrower as the work is completed and verified by the lender. All selected investments are documented in the loan agreement signed by the borrower, and the borrower must generally complete the investments within one year of loan closing.

Data Sources: Loans on Properties with Green Building Certifications

The primary data source for the estimated impact of loans on properties with eligible Green Building Certifications is a detailed analysis of the program requirements for each certification. An independent energy efficiency and green building consulting firm, MKThink, reviewed each green building certification program to identify minimum requirements for each level and type of certification. For example, if a specific level and type of certification required

a minimum energy performance of 15 percent above code, then all loans on properties with that level and type of certification were assumed to meet that minimum performance level.

MKThink provided an energy-savings estimation based on the following approach:

1. Establishing an estimated baseline energy usage using the property square footage and the U.S. National Median Source Energy Intensity²⁰ for multifamily buildings.
2. Determining the minimum energy reduction based on the type and level of Green Building Certification awarded.
3. Determining the baseline adjustment factor, if applicable, based on the difference between the Green Building Certification’s baseline energy standard and the U.S. National Median Energy Usage.

The MKThink water savings analysis, for each security:

1. Establishing an estimated baseline for water usage based on property square footage and the U.S. National Mean Water Use Intensity²¹ for multifamily buildings.
2. Determining the minimum water reduction based on the type and level of Green Building Certification awarded.

To ensure that all impact estimates are conservative, impact calculations were based on the minimum eligibility requirements of each Green Building Certification. If a Green Building Certification does not have a minimum performance threshold for energy or water, it was assumed that there was no energy or water impact for securities collateralized by loans on properties with that certification and therefore none is reported. These are represented by “N/A” in the “Environmental Impact per CUSIP” spreadsheets. As of July 2018, Fannie Mae no longer recognizes Green Building Certifications that do not have an energy- and/or water-saving minimum eligibility requirements.

¹⁸EPA, www.energystar.gov

¹⁹EPA, EPA Quick Converter tool, https://www.energystar.gov/sites/default/files/tools/QuickConverter_v2014.xls

²⁰EPA, Technical Reference, U.S. Energy Use Intensity by Property Type, <https://portfoliomanager.energystar.gov/pdf/reference/US%20National%20Median%20Table.pdf>

²¹EPA, Technical Reference, Water Score for Multifamily Housing in the United States. https://www.energystar.gov/sites/default/files/tools/Multifamily%20Water%20Score%20Technical%20Reference_0.PDF

QUANTIFICATION OF ECONOMIC, FINANCIAL AND SOCIAL IMPACTS

Ernst & Young analyzed the economic and social impacts. Three types of impacts were assessed: direct impacts, indirect impacts, and induced impacts:

Direct impacts are the jobs, GDP, and other measures supported directly by the construction, renovation, and installation activities and the related supply of components that are installed. In the example of a Green Building Certified building, this reflects the construction workers onsite and their corresponding income and GDP contribution from the construction activity. For Green Rewards loans, this includes the plumbers and other tradespeople who installed the components, as well as the workers at the U.S. factory that manufactured the components, their corresponding income, and GDP contribution from the construction activity.

Indirect impacts reflect supply chain impacts. For example, the indirect impact related to Green Building Certification construction includes the activity associated with supplying concrete, steel, lumber, and freight services to the building site. For Green Rewards loans, the indirect impact includes the economic activity that supports the manufacture of components (e.g., suppliers to the manufacturers

of the appliances that are installed) as well as suppliers to the tradespeople conducting the installations (e.g., suppliers of plumber's tape, fittings, etc.).

Induced impacts reflect the economic activity supported by employee consumption. For example, this impact includes the jobs and other activity supported by plumbers' and construction workers' spending at local retailers and restaurants.

These impacts are summarized in terms of four key metrics as well as variations in the amount per dollar of energy and water efficiency measures installed cost and/or dollar of UPB:

- Employment impact is measured in terms of the number of worker years of activity supported by the spending. Conceptually, this is a measure of the headcount of the workers that would be employed for one year due to the construction and installation activities.
- Employee compensation/income supported reflects the total amount of wages, salaries, tips, and other cash and non-cash compensation earned by employees as a result of their employment.
- GDP reflects the value added by the industry, which is equivalent to the sum of payments to labor and capital related to each category of economic activity.



- Contribution to gross economic output is a measure of the value of the goods and services sold by U.S. industries, including the value added by the industry (GDP) as well as the industry’s cost of operating inputs.

Component Cost and **Labor Cost** of property improvements were determined by assigning a ratio to the portion of each type of improvement category that typically represents labor expense vs. component purchase. These assumptions were validated by a number of the consultants who provide the HBP Reports.

Assumed installation service cost of major EWEM categories, as a share of total cost

EWEM Category	Proxy Primary EWEM Item	% installation service cost
Water and sewer conservation	Install low-flush toilets	45%
Heating ventilating and air conditioning	Install or replace heat pumps	33%
Appliances and plug load reductions	Replace refrigerators with ENERGY STAR rated	20%
Lighting	Upgrade in-unit lighting	50%
Renewable energy systems	Install photovoltaic system	40%
Building envelope	Replace windows	30%
Domestic hot water heating	Replace or upgrade individual water heater	48%
Water and steam distribution	Add pipe insulation	50%
Boiler plant improvements	Replace central boiler	50%
Advanced controls and metering	Add or upgrade BAS/EMS/EMCS	50%
Electric motors and drives	Replace with higher efficiency	50%
Chiller plant improvements	Chiller plant	50%

Water-stressed areas were identified by the World Resources Institute’s (WRI) Aqueduct Water Risk Atlas. Water-stressed areas have zip codes that lie within a geographic area categorized as either “high” or “very high” baseline water stress.

Low-income units were defined as units affordable to tenants earning 60% of less of area median income (AMI).

DETAILED LOAN ANALYSIS METHODOLOGY

Credit Facilities and Bulk Deliveries are structured transactions that offer a combination of variable- and fixed-rate debt with laddered maturities and flexible post-closing features, so borrowers can sell, acquire, and rehab properties as needed. Because all the properties in a credit facility or bulk delivery back all the loan and securities associated with that credit facility or bulk delivery, the impacts of the underlying loans were allocated to the corresponding securities based on a ratio of the origination UPB amount for each green property to the total origination UPB dollars for the securities identified as green within the credit facility or bulk delivery. A total of 42 security CUSIPs associated with credit facilities or bulk deliveries backed by 82 properties with Green Mortgage Loans were included in the analysis of the 2012-2018 Green Bond issuances.

Bifurcated loans are a single mortgage loan where the aggregate amount of the debt is divided among two separate notes having the same (i.e., *pari passu*) payment priority. There are five bifurcated loans included in the analysis of the 2012-2018 Green Bond issuances, representing 10 mortgage loans on five underlying properties. The estimated benefits for each set of two loans were split between the two loans based on a ratio of each loan’s origination UPB amount compared to the sum of the total origination UPB amount.

Refinanced loans are loans where the initial mortgage loan has been liquidated and subsequent financing has been placed on the property. There are three refinanced loans included in this analysis where both the initial loan and the refinancing were both Green Mortgage Loans. For these loans, impacts are reported for both the security containing the original loan and the security containing the refinanced loan.

Supplemental loans are subordinate financing options for multifamily properties with an existing Fannie Mae Mortgage Loan. There are two supplemental loans included in this analysis where both the senior loan and the supplemental loan are both Green Mortgage Loans. For these loans, the impacts are reported for both the security containing the original loan and the security containing the supplemental loan.

Bond Credit Enhancements are a type of non-MBS financing. One Green non-MBS financing, which does not have an associated CUSIP, was not included in the analysis of the 2012-2018 Green Bond issuances.

GeMS are a re-securitization of a pool of DUS® MBS into a REMIC structured product. The environmental, social, and financial impacts of Green GeMS can be calculated by summing the impacts of the underlying securities. The impacts of the Green GEMS are laid out on the Environmental Impact per CUSIP: Green REMIC section of this document.

DISCLAIMER

Forward-Looking Statements

This report contains a number of expectations and other forward-looking statements, which may include statements regarding Fannie Mae's business plans and strategies and their impact and Fannie Mae's future business innovations. These forward-looking statements are based on the company's current assumptions regarding numerous factors and are subject to change.

Actual outcomes may differ materially from those reflected in these forward-looking statements due to a variety of factors, including, but not limited to, those described in "Executive Summary," "Forward-Looking Statements," and "Risk Factors" in our annual report Form 10-K for the year ended December 31, 2018. Any forward-looking statements made by Fannie Mae speak only as of the date on which they were made. Fannie Mae is under no obligation to, and expressly disclaims any obligation to, update or alter its forward-looking statements, whether as a result of new information, subsequent events, or otherwise.

No Offer or Solicitation Regarding Securities

This document is for general information purposes only. No part of this document may be duplicated, reproduced, distributed or displayed in public in any manner or by any means without the written permission of Fannie Mae. The document is neither an offer to sell nor a solicitation of an offer to buy any Fannie Mae security mentioned herein or any other Fannie Mae security. Fannie Mae securities are offered only in jurisdictions where permissible by offering documents available through qualified securities dealers or banks.

