



Fannie Mae®



A Decade of Positive Impact

Multifamily Green Bond Impact Report 2019

Table of Contents

About Us	2
Letter from Leadership	4
Executive Summary	6
Fannie Mae and the Global Green Bonds Market	8
Our Triple Bottom Line Impact	14
Understanding Fannie Mae Multifamily and Green Bonds	22
Green Financing Leadership and Transparency	30
Impact Methodology	34

About Us

Fannie Mae is a government-sponsored enterprise (GSE) chartered by the United States Congress in 1938 to help ensure a reliable supply of mortgage funding throughout the country.

Our mission is to provide liquidity and promote stability and affordability in the U.S. single-family and multifamily residential mortgage market, which includes supporting sustainable access to credit for homeownership and affordable rental housing. Since September 6, 2008, Fannie Mae has operated under the conservatorship of the Federal Housing Finance Agency (FHFA) and subsequently entered into a senior preferred stock purchase agreement with the U.S. Department of the Treasury that permits us to continue to fulfill our mission.

As a federally chartered corporation, Fannie Mae supports the liquidity and stability of the U.S. mortgage market primarily by purchasing mortgage loans from lenders and securitizing them into mortgage-backed securities (MBS), which we then guarantee. We operate through two business lines: Single-Family and Multifamily.

The Single-Family business provides financing to individuals and families for properties that have four or fewer residential dwelling units. In 2019, this business provided \$596 billion in mortgage market liquidity, financing 2.3 million single-family mortgage loans, and was the largest issuer of 30-year single-family mortgage-related securities in the country. Our Single-Family business is instrumental in enabling homeownership and home affordability nationwide.

Fannie Mae's Multifamily business provides financing for professionally-owned and operated residential buildings with five or more units. Our Multifamily business provided \$70 billion in multifamily mortgage market liquidity in 2019, which enabled the financing of approximately 726,000 rental units across the country.

In 2010, Fannie Mae launched the Multifamily Green Initiative, which became our Green Financing Business after the issuance of our first multifamily green bond in 2012. Our Green Financing Business supports the multifamily housing market by incentivizing property owners to make energy and water saving improvements and by supporting properties with a Green Building Certification. Selling green bonds into the broader capital markets helps accelerate the transition to a low-carbon economy and greener housing supply. Fannie Mae's green MBS offers rigorous and transparent green investment opportunities for global investors. In 2019, our Green Financing Business issued \$22.8 billion in multifamily green bonds, comprising over 32 percent of Fannie Mae's Multifamily issuances.

726K rental units

Our Multifamily business provided \$70 billion in multifamily mortgage market liquidity in 2019, which enabled the financing of approximately 726,000 rental units across the country.

Our Green Financing Business supports the multifamily housing market by incentivizing property owners to make energy and water saving improvements and by supporting properties with a Green Building Certification.



Reflecting on a decade of positive impact



We are proud of
the role our Green
Financing program
plays in building
more sustainable and
resilient communities.

— Jeff Hayward



For more than 80 years, Fannie Mae has served families in the United States by supporting the affordability, stability, and liquidity of the housing market.

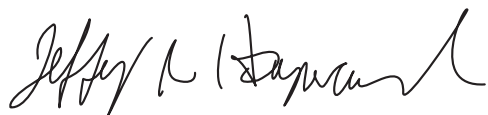
Ten years ago, we launched our Multifamily Green Financing program, connecting investors, lenders, and experts to find creative solutions to common social and environmental challenges. Our program connects investors to green bonds in a way that builds upon our mission and positively impacts housing infrastructure and the environment.

At Fannie Mae, we believe that every loan can be a green loan. What started in 2010 as an initiative to strengthen America's multifamily communities has become a foundational element of global green and sustainable finance. From our first green bond to what is now \$75 billion in total MBS issuances, Fannie Mae's leadership in green mortgage financing has proven that there is opportunity in leveraging the basic tools of finance to unlock capital markets at their best: ones that perform well by taking a holistic view of the environment and communities in which they operate.

Our approach to green financing focuses on improving the environmental footprint, operational efficiency, and longevity of multifamily properties to enable greener, more sustainable neighborhoods and communities for everyone.

We are proud of the role our Green Financing program plays in building more sustainable and resilient communities and of what we have achieved for investors, lenders, borrowers, and the people who live in the properties we finance. I am pleased to share with you the positive impact and achievements of our Green Financing program outlined in this report. In our "Fannie Mae Green Bond Spotlight" features, we present tangible examples of how our green multifamily lending and bond issuances are impacting communities.

We are excited to build upon the 10 years of progress we have made in green financing, and we will continue to look for new ways to advance this important work.



Jeff Hayward
Executive Vice President and Head of Multifamily
Fannie Mae

Delivering impact

Since issuing its first green bond in 2012, Fannie Mae has issued \$75 billion in green bonds and \$9 billion in green resecuritizations.

With \$22.8 billion in green bond issuances in 2019, Fannie Mae has been recognized for the third consecutive year as the largest issuer of green bonds worldwide.¹

The cumulative and growing volume of our green bond issuances is a testament to borrower, lender, and investor demand for quality mortgage financing and investment products that generate positive environmental, social, and financial outcomes.

This report highlights the projected positive environmental, social, and financial impacts of our Green Bonds program through 2019.

For detailed impact data at the security level, please visit our [Green Mission & Impact webpage](#).²

In 2019, Fannie Mae was recognized for the third consecutive year as the largest issuer of green bonds in the world.

¹ "2019 Green Bond Market Summary," Climate Bonds Initiative; climatebonds.net/files/reports/2019_annual_highlights-final.pdf.

² fanniemae.com/greenimpact.

Green Bond triple bottom line impacts

Fannie Mae issuances 2012 – 2019

● Environmental ● Social ● Financial



7.8B

kBtu of source energy saved



7.7B

gallons of water saved



528K

metric tons of greenhouse gas emissions prevented



\$126M

tenant costs saved, or an average of \$178 per family per year



770K

units retrofitted or green building-certified



180K

well-paid jobs created or supported



\$7.6B

wages paid to construct or retrofit properties, contributing \$15.6 billion to U.S. GDP



\$335M

investment committed by borrowers for energy and water efficiency upgrades at 3,200 properties



\$2.99

economic output per dollar invested

Note: All numbers are based on projected impacts.



Fannie Mae and the Global Green Bonds Market



Our 10-year journey

Fannie Mae began laying the groundwork to introduce the concept of green financing to the multifamily mortgage market in 2010.

At that time, the housing sector was struggling to stabilize in the aftermath of the 2008 global financial crisis. The crisis had exposed the housing sector's — and the broader financial sector's — vulnerabilities; we saw green finance as an opportunity to revive multifamily mortgage lending with tools that would shape a greener, stronger, and more resilient market from the ground up.

Since Fannie Mae's first green bond issuance in 2012, we have infused \$75 billion into the global green bonds market through 3,300 individual bonds. As of 2019, we were the leading individual issuer in the more than \$750 billion green bonds market, whose participants include supranational organizations, corporations, financial institutions, and government agencies seeking to raise capital for climate-forward initiatives.³

As the green bonds market has evolved from its early days, so too have Fannie Mae's green financing initiatives, practices, and goals. From the beginning, our strategy focused on delivering triple bottom line impacts by harnessing the power of capital markets to provide capital that supports multifamily properties' performance and longevity through energy and water efficiency improvements. As interest from the market expanded, our products also evolved, from our very first green financing product, Green Preservation Plus, to our current offerings: Green Rewards and loans on properties with Green Building Certifications.

As global investor demand for green bonds has grown,⁴ Fannie Mae has taken a leadership role in product integrity and transparency. We publicly disclose the projected environmental impact of the green bonds in our portfolio at the individual bond level, both at issuance and on an ongoing basis. Our Green Bond Framework has been reviewed and rated by The Center for International Climate and Environmental Research (CICERO), an independent evaluator.⁵

Fannie Mae has issued \$75 billion in green bonds into the \$750+ billion global green bond market.

³ "2019 Green Bond Market Summary," Climate Bonds Initiative: climatebonds.net/files/reports/2019_annual_highlights-final.pdf.

⁴ "2019 Green Bond European Investor Survey," Climate Bonds Initiative: climatebonds.net/files/reports/gb_investor_survey-final.pdf.

⁵ CICERO is an institute for interdisciplinary climate research. Its Shades of Green division offers independent "second opinions" on green bond frameworks. More information is available at cicero.oslo.no/en and cicero.green.

Milestones in the green bond market

Global market

European Investment Bank pioneers the world's first Climate Awareness Bond.

World Bank issues the world's first green bond.

International Capital Markets Association (ICMA) establishes the "Green Bond Principles" voluntary process guidelines for issuing green bonds.⁶

The global green bond market surpasses \$100 billion in cumulative bond issuances.

Global annual green bond issuance volume passes \$100 billion for the first time.

The global green bond market surpasses \$500 billion in cumulative bond issuances.⁷

The global green bond market surpasses \$750 billion in cumulative bond issuances.

Fannie Mae

Fannie Mae launches the Multifamily Green Initiative, laying the groundwork to introduce the concept of green financing to the multifamily mortgage market.

Fannie Mae launches our first green financing product, in partnership with the U.S. Department of Housing & Urban Development.

Fannie Mae tests new products targeting multiple impacts, launching the Multifamily Property Improvements to Reduce Energy (M-PIRE) product in partnership with the New York City Energy Efficiency Corporation.

Fannie Mae develops standards and streamlined processes, including adopting the ENERGY STAR® score and creating our energy and water audit protocol, the High Performance Building Report.

Fannie Mae launches Green Rewards, a nationally available financing product that incentivizes energy and water saving improvements to existing multifamily properties.

Fannie Mae begins reporting CUSIP-level data, which heightens the transparency, rigor, and standards of green mortgage financing and bonds.

Fannie Mae is first recognized as the largest issuer of green bonds in the world.

Fannie Mae is recognized by GlobalCapital as the Most Impressive Green/SRI ABS Issuer; by the U.S. EPA as an ENERGY STAR Partner of the Year — Sustained Excellence; and by Climate Bonds Initiative as the largest issuer of green bonds worldwide.

Our ability to construct a green bond program that meets investors' needs with openness, diligence, and rigor has facilitated the program's growth and impact. As more players enter the market, we strive to set an example for responsible and transparent green financing.

Over the past decade, we have reached a number of important milestones and made significant impacts. As we move into our second decade in green financing, we are committed to exploring new opportunities to amplify the broader range of positive impacts with new mortgage lending instruments and bonds.

⁶ "Green Bond Principles & Climate Bonds Standard," Climate Bonds Initiative: climatebonds.net/market/best-practice-guidelines.

⁷ "2019 Green Bond Market Summary," Climate Bonds Initiative: climatebonds.net/files/reports/2019_annual_highlights-final.pdf.

Leading by example: Championing the growth and sophistication of green finance

Since launching our Green Financing initiative 10 years ago, Fannie Mae has focused on connecting the power of capital markets and investors with green benefits in multifamily housing.

“Buildings” as a category, which would include housing, is ranked among the top three “interest sectors” for investors pursuing a green investment strategy.⁸ As an early adopter and advocate of green financing in the housing sector, Fannie Mae has delivered significant opportunities for investors to invest in this sector, having issued over 3,300 individual green bonds amounting to \$75 billion, as of December 31, 2019. We have also supported the growth, sophistication, and maturity of housing-related green finance by investing in the transparency and rigor of our own products, processes, and standards, thereby building a foundation for others to replicate and expand upon our work. Here’s how:

▶ **We piloted products with triple bottom line impact:**

Over time we have piloted, iterated, and refined our product offerings in response to market and investor needs. Today, Fannie Mae offers two green financing options, Green Rewards and loans on properties with Green Building Certifications, through our Delegated Underwriting and Servicing (DUS[®]) lender partners. These green financing loans allow Fannie Mae to spread positive social, environmental, and financial impact throughout the multifamily housing market.

▶ **We developed standards and streamlined processes:**

Early on, we realized that integrating green financing requirements into the existing multifamily lending process would be key to our success. To that end, we established new metrics that allowed the market to easily assess the energy and water performance of a property through our partnership with the EPA, and we pioneered an energy and water audit that could be completed within the standard DUS loan time frame while still providing the rigor needed to produce reliable data and projections of energy, water, and greenhouse gas savings.

⁸ “2019 Green Bond European Investor Survey,” Climate Bonds Initiative: climatebonds.net/files/reports/gb_investor_survey-final.pdf.

► **We educated lenders and property owners:**

Education has been key to industry adoption of our green financing loans. In the early years, Fannie Mae focused on educating our DUS lender partners about the benefits of the Green Financing program, including property utility cost savings, improved resiliency, and market-leading environmental responsibility in the face of natural resource supply constraints. Over time, our lender partners became green financing enthusiasts, sharing the knowledge and benefits with multifamily property owners across the country.

► **We created innovative and rigorous reporting:**

Recognizing that investors are key to the long-term growth of our Green Bond program, we have committed to providing rigorous and transparent bonds. Our disclosure data system has included green data metrics for four years and, starting with our first Impact Report released in March 2019, we provide CUSIP-level projected savings data.

► **We raised the bar:**

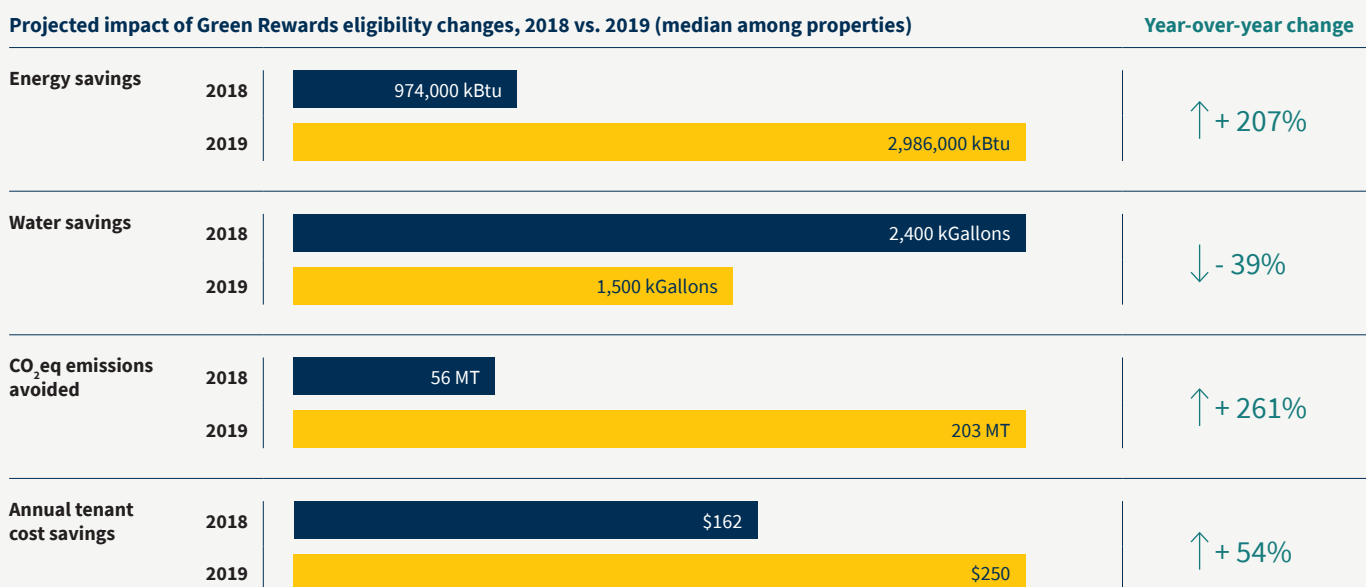
Every year we reassess our green financing products and eligibility requirements and identify opportunities to increase our impact. Over the years, we have increased the minimum projected energy and water savings required to qualify for Green Rewards three times, and we have added and removed eligible Green Building Certifications based on our increasing minimum-efficiency standards. Some Green Building Certifications have even raised their own standards in response to our eligibility requirements.

Raising the bar

Small changes can have a large impact

We raised our Green Rewards eligibility standard for 2019 to require minimum projected energy savings of 15 percent and combined energy and water savings of at least 30 percent; the 2018 eligibility standard was a minimum projected energy

or water savings of 25 percent, which led most property owners to primarily opt for water saving improvements. As a result of the 2019 eligibility change — and because most tenants pay for their own energy usage — energy savings, CO₂-equivalent emission reductions, and tenant savings are projected to be much higher for 2019 loans than for 2018 loans.





Our Triple Bottom Line Impact

Sustainability and the triple bottom line

When we launched our Multifamily Green Financing Business 10 years ago, our goal was to foster greener, more efficient, and more affordable housing communities.

In pursuit of this goal, we have created innovative financing solutions that leverage traditional mortgage lending structures to incentivize more sustainable building practices and launch new capital market executions. Our green bond issuances specifically support green building and energy and water efficiency retrofits in U.S. rental housing, promoting more affordable homes for individuals and families, more cost-effective properties for owners, and more sustainable housing communities overall.

This report captures the triple bottom line — environmental, social, and financial — impacts of our green bonds at the portfolio level. The environmental impact projections are also available at the CUSIP level in the Excel file on our [Green Mission & Impact webpage](#).⁹

Environmental impact

Building construction and operations were responsible for 36 percent of worldwide energy consumption and almost 40 percent of energy-related carbon dioxide (CO₂) emissions in 2017,¹⁰ of which the multifamily housing sector emits a significant share. Fannie Mae analysis of our Green Rewards portfolio shows that multifamily properties' median potential energy savings is 34 percent and median potential water savings is 28 percent, illustrating that most multifamily properties have significant opportunities to reduce their environmental impacts.

We report on three environmental impact metrics at the portfolio level for our green bond issuances: projected energy consumption reductions; projected water consumption reductions; and projected greenhouse gas emissions reductions.

Projected environmental impact

	2019 Issuances	2012 – 2019 Cumulative issuances
Source energy saved (kBtu)	3.6 billion	7.8 billion
Greenhouse gas emissions avoided (metric tons)	240,000	528,000
Water saved (gallons)	1.8 billion	7.7 billion

⁹ [fanniemae.com/greenimpact](https://www.fanniemae.com/greenimpact).

¹⁰ "2018 Global Status Report," Global Alliance for Buildings and Construction (2018): worldgbc.org/sites/default/files/2018%20GlobalABC%20Global%20Status%20Report.pdf.



Fannie Mae Green Bond Spotlight

Financing solar power at Bayside Palms

In San Diego, California, Fannie Mae's Green Financing program is enabling the installation of solar panels on a manufactured housing community (MHC) that could significantly reduce electricity costs at the property.

Fannie Mae DUS lender partner Capital One provided an \$8.2 million refinancing loan for the Bayside Palms community, a 107-unit MHC. The borrower elected to use Fannie Mae's Green Rewards program to finance the installation of solar panels on covered parking structures throughout the property.

Once completed, the installation will consist of six solar arrays, totaling 394 individual panels. The solar panels are projected to reduce the property's electricity costs by more than 90 percent (reducing overall energy use by 45 percent), providing almost \$500,000 of savings over 10 years.

Multifamily MHC properties like Bayside Palms comprise common areas and "pads," or land plots, on which the manufactured housing residences are installed; the collateral does not include the individual residences. For this reason, installing a solar photovoltaic system is the most impactful way for an MHC property to improve its energy performance and save on energy costs.

— Learn more about this green bond by searching CUSIP 3140HUV1¹¹ in [DUS Disclose](#),¹² our multifamily disclosure platform.

Solar panels in manufactured housing communities can generate significant cost savings.

¹¹ This reference is for informational purposes only and is not an offer of securities. Before buying any Fannie Mae security, potential investors should read and understand the offering documents for such securities.

¹² mfdusdisclose.fanniemae.com.

Our Triple Bottom Line Impact *continued*

Social impact

Nearly half of U.S. tenants spend more than 30 percent of their income on rent.¹³ Adding in utility bills and other costs of renting are particularly burdensome for low-income tenants, for whom utility bills can amount to more than seven percent of earnings (compared to 3.5 percent for the median U.S. household).¹⁴

Fannie Mae green financing can positively impact multifamily tenants by making their homes more affordable. Improving properties' energy and water efficiency reduces tenant household expenses and conserves disposable income for other needs, such as education, transport, health care, and savings. The health and safety benefits of better lit and heated homes help build stronger neighborhoods over the long term.

We report on three social impact metrics at the portfolio level: number of units retrofitted and/or Green Building Certified; energy and water cost savings from financed building improvements and Green Certified multifamily buildings; and green jobs created or supported.

Projected social impact

	2019 Issuances	2012 – 2019 Cumulative issuances
Units retrofitted or Green Building Certified	213,000	770,000
Utility costs saved for tenants ¹⁵	\$53 million; average \$254 per family per year	\$126 million; average of \$178 per family per year
Well-paid jobs created or supported	9,000	180,000

Fannie Mae's 2019 change in eligibility standards for Green Rewards loans helped drive increased affordability for tenants. Fannie Mae analysis of our Green Rewards data shows that 96 percent of tenants pay for their own electricity costs, compared to only 66 percent who cover their own water consumption costs.¹⁶ This means that the increased emphasis on energy savings in 2019 benefits tenants as well as the environment. Indeed, projected tenant cost savings for our median 2019 Green Rewards loan are 54 percent higher than the projected tenant cost savings for our median 2018 Green Rewards loan.

Our green bonds have a positive socioeconomic impact in the employment sector as well, by creating jobs for workers hired to install energy and water saving improvement measures for Green Rewards properties and to construct properties with Green Building Certification. The green economy is a fast-growing and well-paying sector in the U.S., employing as much as 10 percent of the workforce¹⁷ in jobs that typically pay above the nation's average annual salary.

Improving energy and water efficiency reduces tenant household expenses and conserves disposable income for needs such as education, transport, health care, and saving for the future.

10% of the workforce

The green economy is a fast-growing and well-paying sector in the U.S., employing as much as 10 percent of the workforce in jobs that typically pay above the nation's average annual salary.

¹³ Sean Veal and Jonathan Spader, "Nearly a Third of American Households Were Cost-Burdened Last Year," Joint Center for Housing Studies of Harvard University (December 7, 2018): jchs.harvard.edu/blog/more-than-a-third-of-american-households-were-cost-burdened-last-year.

¹⁴ Ariel Dreihobl and Lauren Ross, "Lifting the High Energy Burden in America's Largest Cities: How Energy Efficiency Can Improve Low Income and Underserved Communities," Energy Efficiency for All and American Council for an Energy-Efficient Economy (April 2016): assets.ctfassets.net/ntcn17ss1ow9/1UEmqh5159cFaHM-qVwHqMy/1ee1833cbf370839d9dbdf6989ef8b8b4/Lifting_the_High_Energy_Burden_0.pdf.

¹⁵ Represents Green Rewards properties where tenant savings are projected.

¹⁶ Fannie Mae Green Rewards Mortgage Loan acquisitions, 2016 – 2019.

¹⁷ Alex Bowen, Karlygash Kuralbayeva, and Eileen L. Tipoe, "Characterising green employment: The impacts of 'greening' on workforce composition," Energy Economics, vol. 72 (May 2018), pp. 263 – 275: sciencedirect.com/science/article/pii/S0140988318300963.



Fannie Mae Green Bond Spotlight

Greener, healthier housing for low-income families at Amani Place

At Amani Place housing development in Atlanta, Georgia, tenants and investors are reaping the rewards of triple bottom line financing. Amani Place, formerly known as Edgewood Court, consisted of 204 very low-income, government-subsidized units when it was acquired in 2017 by Jonathan Rose Companies and Columbia Residential. The owners secured a Green Rewards mortgage loan on the basis of their energy and water saving improvement plans. In addition to preserving the 204 existing units, their renovation plan added 18 new units for households earning no more than 60 percent of the Area Median Income (AMI).

Alongside DUS partner Capital One, Fannie Mae coupled Green Rewards financing with our Healthy Housing Rewards™ financing, because planned community gardens, playgrounds, fitness facilities, and indoor air quality improvements would support local health and well-being. Supported by a \$23 million green DUS MBS backing a tax-exempt bond (M.TEB¹⁸) with Invest Atlanta, the upgrades were completed in October 2019, and residents now enjoy greener surroundings and healthier homes.¹⁹ With Fannie Mae's green financing, the property installed water saving improvements and ENERGY STAR-certified washing machines; as a result, the property is projected to reduce total water usage by 39 percent and save more than \$175,000 annually in energy and water costs.

“This sustainable, state-of-the-art community will enhance lives and serve families for generations,” said Jim Grauley, President of Columbia Residential. “With the help of our partners, Columbia Residential is very proud to preserve and increase affordable housing in Atlanta and welcome both returning residents and new ones to their homes at Amani Place.”

— Learn more about this green bond by searching CUSIP 3138LMCM3²⁰ in [DUS Disclose](#).²¹

\$175,000 annual energy and water costs savings

Amani Place is projected to reduce total water usage by 39 percent and save more than \$175,000 annually in energy and water costs.

¹⁸ M.TEBs, or “MBS as a Tax-Exempt Bond Collateral,” are part of the Multifamily Financing Business product designed to support the preservation and rehabilitation of multifamily affordable housing properties that qualify for Low-Income Housing Tax Credits (LIHTC). More information is available multifamily.fanniemae.com.

¹⁹ “Creating Healthier, Greener Affordable Housing at Edgewood Court Apartments,” Fannie Mae: multifamily.fanniemae.com/sites/g/files/koqyhd161/files/migrated-files/content/fact-sheet/healthy-design-case-study-edgewood-court.pdf.

²⁰ This reference is for informational purposes only and is not an offer of securities. Before buying any Fannie Mae security, potential investors should read and understand the offering documents for such securities.

²¹ mfdusdisclose.fanniemae.com.

Our Triple Bottom Line Impact *continued*

Financial impact

Fannie Mae's green bonds can create significant value for investors, lenders, and property owners through reduced utility expenses. In the multifamily housing sector, energy costs account for about nine percent of rent receipts.²²

Even more wide-reaching, however, is the projected economic value created through employment (both in retrofitting properties and through green manufacturing supply chains), local spending, and community development — all of which have a transformational effect on local and regional economies.

We track several financial metrics: the investment in energy and water efficiency improvements; the economic output of this investment; and wages and overall economic contribution of those jobs.

Projected financial impact

	2019 Issuances	2012 – 2019 Cumulative issuances
Number of properties	999	3,200
Borrower investment commitment for energy and water efficiency upgrades	\$127 million	\$335 million
Economic output per dollar invested	\$2.45	\$2.99
Wages	\$390 million	\$7.6 billion
Wage contribution to U.S. GDP	\$910 million	\$15.6 billion

The key driver of Fannie Mae Green Bonds' financial value creation is reduced utility expenses, but the bonds also have wider-reaching projected impacts, including economic value created through employment, local spending, and community development.

²² Michael Carliner, "Reducing Energy Costs in Rental Housing," Joint Center for Housing Studies of Harvard University (December 2013): jchs.harvard.edu/sites/default/files/harvard_jchs_carliner_research_brief.pdf.



Fannie Mae Green Bond Spotlight

Greener housing for senior citizens at Noble Tower

In November 2019, Fannie Mae partnered with DUS lender Wells Fargo and the California Housing Finance Agency to issue green tax-exempt financing for Noble Tower, an age-restricted property for low-income seniors in Oakland. By leveraging our Green Bond Framework, the California Housing Finance Agency was able to issue a \$74 million green M.TEB, backed by the mortgage loan on Noble Tower.

The deal was significant in that its tax-exempt status enabled the municipal bond to appeal to a new base of investors, including socially responsible and municipal bond investors.

With Green Rewards financing, retrofits are projected to deliver 15 percent energy savings and 16 percent water savings at Noble Tower, resulting in more than \$60,000 annual utility cost savings.

— [Learn more about this green bond by searching CUSIP 3140HWNM0²³ in DUS Disclose.](#)²⁴

16% water savings

With Green Rewards financing, retrofits at Noble Tower are projected to deliver 15 percent energy savings and 16 percent water savings

²³ This reference is for informational purposes only and is not an offer of securities. Before buying any Fannie Mae security, potential investors should read and understand the offering documents for such securities.

²⁴ mfdusdisclose.fanniemae.com.



Understanding Fannie Mae Multifamily and Green Bonds

About the Fannie Mae Multifamily Business

Fannie Mae's Green Financing Business is part of our Multifamily Business, which is a leading provider of housing finance in the U.S.

As of December 2019, total U.S. multifamily mortgage debt outstanding stood at more than \$1.5 trillion. Fannie Mae's share of that debt is approximately \$329 billion, or 21 percent of the market.

For more than 30 years, Fannie Mae has facilitated financing for more than 10 million units of rental housing catering to all income levels. Our Multifamily mortgage business is built upon a network of lending partners, collectively referred to as our DUS lenders. DUS lenders provide mortgage loans to commercial real estate owners to acquire multifamily properties. If a loan conforms to Fannie Mae's standards, DUS lenders may then sell the loan to Fannie Mae to guarantee and securitize in the form of an MBS. These securities are then sold to investors in the capital markets as agency commercial mortgage-backed securities (CMBS).²⁵ These high-quality securities attract private capital to the secondary mortgage market, bringing vital liquidity to the sector and supporting the affordability of rental housing.

A key factor in the success of Fannie Mae Multifamily's DUS model is the risk-sharing structure with each of our DUS lenders. Through our DUS program, Fannie Mae retains approximately two-thirds of the underlying credit risk of each loan, while individual lenders typically retain one-third of the risk. This allocation creates shared interest between Fannie Mae and our lending partners and shared accountability for the performance of every loan over the life of the loan.

10M rental units

Fannie Mae has facilitated financing for more than 10 million units of rental housing over the past 30 years.

²⁵ Mortgage-backed securities and commercial mortgage-backed securities created by Fannie Mae, Ginnie Mae, and Freddie Mac are known as "agency" MBS and CMBS.

DUS lenders

As of December 31, 2019

Arbor Commercial
Funding I, LLC

Barings Multifamily
Capital LLC

Bellwether Enterprise
Real Estate Capital, LLC

Berkadia Commercial
Mortgage, LLC

Capital One, National
Association

CBRE Multifamily
Capital, Inc.

Citi Community Capital

Dougherty Mortgage

Grandbridge Real Estate
Capital, LLC

Greystone Servicing
Company LLC

HomeStreet Capital
Corporation

Hunt Mortgage
Capital, LLC

Jones Lang LaSalle
Multifamily, LLC

JPMorgan Chase Bank

KeyBank National
Association

M&T Realty Capital
Corporation

Newmark Knight Frank

NorthMarq

ORIX Real Estate
Capital, LLC

PGIM Real Estate

PNC Real Estate

Regions

Truist

Walker & Dunlop, LLC

Wells Fargo Multifamily
Capital

Note: Subsequent to Dec. 31, 2019, Dougherty Mortgage became Colliers Mortgage LLC; Hunt Mortgage Capital, LLC merged into ORIX Real Estate Capital; Jones Lang LaSalle Multifamily, LLC became JLL Real Estate Capital, LLC; and Truist's DUS Servicing portfolio merged with Grandbridge Real Estate Capital, LLC. For a current list of DUS Lenders, visit multifamily.fanniemae.com/about-multifamily/our-partners/dus-lenders.

Defining the multifamily housing market

Multifamily housing

- Is an important part of the U.S. housing supply, impacting 37 percent of the 43 million U.S. renter households who reside in properties with five or more units.²⁶
- Can be found in any community — urban, suburban, and rural alike.
- Includes high-rise apartments, garden-style units, and specialty housing, such as senior, student, or manufactured housing.
- Houses tenants, both individuals and families, who sign six- to 24-month leases, which support the properties' long-term income stability.
- Rents can be based on market rates or restricted to ensure affordability for tenants earning less than a specified percentage of local Area Median Income (AMI).



²⁶ "Quick Facts: Resident Demographics," National Multifamily Housing Council: nmhc.org/research-insight/quick-facts-figures/quick-facts-resident-demographics.

Fannie Mae Multifamily Green Bonds

Fannie Mae issues green bonds as two types of securities: green MBS and green Guaranteed Multifamily Structures (Fannie Mae GeMS™).

Each Fannie Mae green financing product is initially issued as a green MBS, which is secured by a single DUS green loan backed by a single multifamily property (more on the types of green loan products we offer below). Fannie Mae GeMS, as explained on page 29, are composed of pools of green MBS that are resecured in a structured product known as a Real Estate Mortgage Investment Conduit (REMIC).

Fannie Mae's annual green bond issuance volumes are calculated based on the individual green MBS from our Multifamily business. In 2019, Fannie Mae issued \$22.8 billion of green MBS as part of its total \$70 billion multifamily MBS issuance. In addition, Fannie Mae resecured \$2.9 billion of its green MBS into GeMS REMIC structures for investors preferring a diversified collateral pool or specific cash flow and payment criteria.

The scale, strength, and rigor of our green bonds stem from the fact that Fannie Mae relies on its existing multifamily mortgage financing infrastructure and processes. Our long-standing DUS lender network is the salesforce of our Multifamily Financing Business, including our Green Financing Business, and is engaged in all phases of the mortgage process — from underwriting, to asset management, to servicing. Leveraging and educating this network to extend green mortgage financing solutions has enabled our Green Financing program to reach more borrowers and amplify impact.

Investors in Fannie Mae's green bonds can identify and quantify the impact of each green MBS or GeMS tranche on an individual security basis by searching for each security's unique CUSIP number on Fannie Mae's [Green Mission & Impact webpage](#). The resecuritization process does not generate new impact numbers; rather, Fannie Mae assigns the impact of the underlying green MBS collateral to the green GeMS tranches by CUSIP to allow the GeMS investors to quantify the impact of their investments.

\$22.8B of green MBS

In 2019, Fannie Mae issued \$22.8 billion of green MBS as part of its total \$70 billion multifamily MBS issuance.

Fannie Mae Environmental Impact Per CUSIP²⁷: Green MBS
2012 – 2019

Security CUSIP	Green Financing Type	Issue Date	Issuance UPB (\$USD)	Projected Annual Energy Savings (kBtu)	Projected Annual CO ₂ eq Emissions (MT)	Projected Annual Water Savings (gallons)
3140HV4R2	Green Rewards	01-Dec-2019	9,820,000	1,908,303	137	1,317,980
3140HV7B4	Green Rewards	01-Dec-2019	28,665,000	2,300,369	127	1,096,000
3140HV7C2	Green Rewards	01-Dec-2019	34,905,000	4,486,072	310	3,038,000
3140HVLT9	Green Rewards	01-Dec-2019	3,920,000	1,134,299	75	506,390
3140HVU44	Green Rewards	01-Dec-2019	1,155,000	1,015,702	71	291,020
3140HVWE0	Green Rewards	01-Dec-2019	38,250,000	5,512,182	324	1,842,000
3140HW4G4	Green Rewards	01-Dec-2019	336,258,000	15,898,702	1,092	9,545,180
3140HWEB4	Green Rewards	01-Dec-2019	58,960,000	14,173,690	807	4,039,260
3140HWGA4	Green Rewards	01-Dec-2019	29,026,000	2,261,148	123	787,000
3140HWL26	Green Rewards	01-Dec-2019	37,150,000	6,176,958	443	2,753,230
3140HWMR0	Green Rewards	01-Dec-2019	22,425,000	1,630,678	109	1,347,060
3140HWMT6	Green Rewards	01-Dec-2019	18,318,000	4,231,414	303	1,079,580

Fannie Mae Environmental Impact Per CUSIP²⁷: Green REMIC
2012 – 2019

GeMS Deal Name	Class	CUSIP	Green Collateral Group	Class Issuance UPB (\$USD)	Projected Annual Energy Savings (kBtu)	Projected Annual CO ₂ eq Emissions Savings (MT)	Projected Annual Water Savings (gallons)
FNA 2019-M22	A1	3136B6XH1	Only group	75,000,000	12,168,998	848	5,486,819
FNA 2019-M22	A2	3136B6XJ7	Only group	701,098,362	113,755,527	7,924	51,290,663
FNA 2019-M22	A3	3136B6XK4	Only group	332,000,000	53,868,098	3,752	24,288,318
FNA 2019-M9	A1	3136B4UH9	Only group	57,700,000	7,984,097	535	7,766,834
FNA 2019-M9	A2	3136B4VT2	Only group	547,594,779	75,772,095	5,077	73,710,182
FNA 2019-M9	A3	3136B4XP8	Only group	200,000,000	27,674,513	1,854	26,921,433
FNA 2019-M1	A1	3136B3UQ1	Only group	81,500,000	5,045,971	312	11,669,661
FNA 2019-M1	A2	3136B3XY1	Only group	915,087,256	56,656,491	3,498	131,027,710
FNA 2018-M13	A1	3136B3DB3	Group 2	64,000,000	7,258,932	446	14,403,753
FNA 2018-M13	A2	3136B3DE7	Group 2	532,598,608	60,407,769	3,710	119,865,916

Fannie Mae publishes the projected environmental impact of each Green Bond. To find the impact by issuance, visit fanniemae.com/greenimpact.

²⁷ CUSIP references are for informational purposes only and are not an offer of securities. Before buying any Fannie Mae securities, potential investors should read and understand the offering documents for such securities.

Understanding Fannie Mae Multifamily and Green Bonds *continued*

Our green financing products

When we first launched our Multifamily Green Financing Business, we elected to leverage our strong, established DUS foundation. By testing several iterations of green loan products, we created our core green financing offerings available to commercial, institutional, and nonprofit multifamily housing organizations that secure financing through our DUS lenders. Our two core financing products are Green Rewards loans and Green Building Certification loans. These loans are originated with the same process and credit standards as all other multifamily DUS loans, but with the added rigor of conforming to Fannie Mae’s robust Green Bond Framework.

Green Rewards Mortgage Loan

Loan objective:

Incentivize investment in energy- and water-efficiency measures, including, but not limited to:

- Energy-efficient heating, ventilation, and air conditioning systems.
- Energy-efficient lighting and appliances.
- Water-efficient fixtures, including irrigation timers and WaterSense® certified low-flow toilets and faucets.
- On-site solar photovoltaic systems.

Eligibility criteria:

Properties financed with a Green Rewards loan must project a minimum of 30 percent combined energy and water consumption savings, with a minimum of 15 percent savings from reduced energy consumption or renewable energy generation.

Use of proceeds:

Proceeds to make the energy and water-efficiency improvements are held in escrow. Improvements must be made within one year of the loan’s closing date. The lender will only release the escrowed funds after the work is completed by the borrower and verified by the loan servicer.

Green Building Certification Mortgage Loan

Loan objective:

Incentivize development and certification of energy- and water-efficient properties that have been awarded one of 35 recognized Green Building Certifications vetted annually by Fannie Mae.

In 2019, Fannie Mae added a “Towards Zero” designation for properties targeting net-zero energy or carbon emissions through a combination of highly efficient and innovative construction practices and renewable energy generation.

Eligibility criteria:

Fannie Mae recognizes select Green Building Certifications that have passed our annual rigorous analysis of certifications applicable to U.S. multifamily, commercially operated properties. This list is available on Fannie Mae’s [Green Building Certification webpage](#).²⁸

Use of proceeds:

Proceeds finance properties with Green Building Certifications. The borrower is responsible for costs incurred to obtain the certification; loan proceeds may be used to reimburse the borrower for those costs.

²⁸ Fannie Mae Green Building Certifications: multifamily.fanniemae.com/financing-options/specialty-financing/green-financing/green-financing-loans/green-building-certifications.

Green mortgage-backed securities

Fannie Mae's green MBS are backed by an individual green loan originated by one of our DUS lenders in compliance with our published DUS origination and servicing standards. The lender enters into a locked interest rate with the borrower for each loan, with the rate determined through solicitation of bids from the general investor community for the lowest coupon on the MBS. Our lenders then have 30 to 60 days after the rate-lock to complete the loan closing and deliver the loan to Fannie Mae, where the loan is then securitized with the Fannie Mae guaranty and delivered to the investor as a Fannie Mae MBS. For loans to be labeled as Fannie Mae green MBS, they must also undergo an energy and water audit or provide a Fannie Mae-recognized Green Building Certification during the post-rate-lock period. This process ensures that borrowers receive the best possible rate of mortgage financing and creates price transparency for the investor community.

Fannie Mae green bonds are a subset of Fannie Mae's total securities, benefiting from the same features, including prepayment protection and conservative credit underwriting. Fannie Mae also guarantees timely principal and interest payments to the investor for all of our MBS, including our green bonds.

Fannie Mae GeMS™

Fannie Mae's Green Bond offering also includes green GeMS, which are resecuritized pools of green MBS structured as REMICs. The intended audience for green GeMS is investors looking for a more diversified investment product than a single green MBS, whether that is property-type diversity or geographic diversity, and who are interested in larger, block-sized transactions. Green GeMS also serve investors looking for specific payment structures. MBS aggregated into a REMIC structure are typically segmented into sequential-pay tranches and interest-only tranches to meet investors' different cash flow demands.

Fannie Mae began incorporating green MBS in our GeMS issuances in 2017, and we now issue approximately three green GeMS every year. These GeMS deals range in size from \$500 million to \$1 billion, are U.S. dollar-denominated, and are backed by the same Fannie Mae credit as the underlying DUS MBS pools. Fannie Mae's long-term senior debt is [currently rated](#) AA+ by S&P, Aaa by Moody's, and AAA by Fitch.²⁹

Of our total \$75 billion in green MBS issuances, Fannie Mae has re-securitized \$9 billion as green REMICs through the GeMS program. Investors can look up green GeMS tranches by their CUSIP number or on our [monthly list of green MBS and GeMS REMICs](#).³⁰

Fannie Mae was the first in the global green bond market to offer green REMIC structures.

²⁹ [fanniemae.com/resources/file/debt/pdf/understanding-debt/credit_rating.pdf](https://www.fanniemae.com/resources/file/debt/pdf/understanding-debt/credit_rating.pdf).

³⁰ [fanniemae.com/greenimpact](https://www.fanniemae.com/greenimpact).



Green Financing Leadership and Transparency

Transparent and accountable

Fannie Mae is committed to advancing the growth of an active and transparent global green bonds market.

To demonstrate this commitment, we choose to lead by example: by developing and aligning with industry standards, such as ENERGY STAR scores; by investing in our green financing data disclosure process and open-source platform; and by seeking independent evaluation and review of our green financing and green bond initiatives.

Our view is that being transparent about our performance successes and challenges both enables investors to make informed, long-term decisions and elevates investor expectations of the market overall. We are proud of our recognized leadership in this market.

Alignment to Green Bond Principles

We are committed to high-quality and high-impact green financing, which is why we align to ICMA's Green Bond Principles. Our green loan programs have been independently rated by CICERO, an institute for interdisciplinary climate research whose Shades of Green division offers independent "second opinions" on green bond frameworks. Our Green Rewards program received a "light to medium green" rating for its potential long-term contribution to a low-carbon future, while our Green Building Certification program received a "light green" rating. CICERO specifically recognized Fannie Mae's:

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

CICERO's Second Opinion can be found on the Fannie Mae Multifamily Green Bonds [webpage](#).³¹

Fannie Mae is committed to high-quality and high-impact green financing, which is why we align to ICMA's Green Bond Principles and why our green loan programs have been independently reviewed and rated by CICERO.

³¹ "'Second Opinion' on Fannie Mae Multifamily Green Bond Framework," CICERO: [multifamily.fanniemae.com/financing-options/specialty-financing/green-financing/green-bonds](https://www.fanniemae.com/financing-options/specialty-financing/green-financing/green-bonds).

Investor disclosure

As part of our standard multifamily loan securitization process, we share detailed information on each DUS MBS, including the security, loan, and property-level information at [DUS Disclose](#).³² For each green MBS, we also publicly disclose energy and water performance metrics. Depending on the loan type and security issuance date, investors and the public can search by the CUSIP identifier for each property to find out:

- Type of green financing loan.
- Green Building Certification, where applicable.
- ENERGY STAR Score at issuance, where applicable.
- Source Energy-Use Intensity at issuance, where applicable.
- Dates of the above two data points where applicable.
- EPA Water Scores and Water-Use Intensity at issuance (from 2019 for Green Rewards Mortgage Loans only).

Investors can also access the environmental impact per CUSIP for green MBS and green REMICs on our [Green Mission & Impact webpage](#).³³ These data includes:

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

In addition, in 2019 we started publishing ongoing monthly energy and water metrics for green MBS on [DUS Disclose](#).³⁴

³² mfdusdisclose.fanniemae.com.

³³ fanniemae.com/greenimpact.

³⁴ mfdusdisclose.fanniemae.com.



Impact Methodology

Impact Methodology

Introduction

This section explains how Fannie Mae estimates the environmental, social, and financial impacts of our Multifamily Green Financing business. It includes the data sources, analysis methods, and applied assumptions. The ex-ante quantification of each security’s impact is based on projections and estimations calibrated to industry standards.

The methodology described in this section applies to the 991 green bonds Fannie Mae issued from January 1, 2019, through December 31, 2019, and to one green bond issued in December 2018 that was not included in the Multifamily Green Bond Impact Report 2012 – 2018. For all metrics, estimated impacts are reported for the year in which the loan was acquired by Fannie Mae. Financial impacts are not inflation-adjusted. Also, impacts have not been recalculated for prior year issuances, as some inputs and conversion factors change over time.

2019 Population and impact methodology	2012 – 2019 Cumulative population and impact methodology ³⁵
<ul style="list-style-type: none">991 green bonds issued in 2019 calendar year (analyzed with 2019 methodology).	<ul style="list-style-type: none">2,372 green bonds issued 2012 – 2018 (analyzed with 2012 – 2018 methodology).1 green bond issued in December 2018 (analyzed with 2019 methodology).991 green bonds issued in calendar year 2019 (analyzed with 2019 methodology).

Fannie Mae reports impact as one-year impact occurring in the first year of the green bond, even though, in reality, many of the benefits of green mortgage loans may be realized later in the life of the loan and to some degree every year throughout the life of the loan. Only one-year impacts are reported because impacts may change over time, or they may not be realized until a later date when property improvements have been completed, and because Fannie Mae cannot predict the duration of each security.

The single-year impacts for Green Rewards loans were based on the type and installation cost of energy and water saving capital improvements selected for each property, and those improvements’ projected annual energy and water savings compared to the property’s historical 12-month consumption, regardless of whether those improvements were completed by the end of 2019. The single-year impact for loans on properties with Green Building Certifications (GBCs) represents the estimated cost of construction of the building and the estimated impact of the property’s green construction and operation compared to a modeled equivalent non-green property.

³⁵ There may be minor variations between the set of securities in this analysis and the full list of Green MBS listed on the Green Financing webpage or on DUS Disclose. In the course of normal business operations, data may be corrected after delivery of the loan to Fannie Mae.

Impact data sources

The impacts were calculated by Ernst & Young (EY) and the Integral Group based on their analysis of Fannie Mae data and additional data as defined below.

Inputs	Securities Backed by Green Rewards Mortgage Loans	Securities Backed by Mortgage Loans on Properties with GBCs
Energy Consumption Reductions	EY analysis of Fannie Mae High Performance Building Report Data	Integral Group analysis of Green Building Certifications and Fannie Mae loan data
Greenhouse Gas Emissions Reductions	EY analysis of Fannie Mae High Performance Building Report Data	Integral Group analysis of Green Building Certifications and Fannie Mae loan data
Water Consumption Reductions	EY analysis of Fannie Mae High Performance Building Report Data	N/A
Cost Savings Associated with Energy and Water Consumption Reductions	EY analysis of Fannie Mae High Performance Building Report Data	Integral Group analysis of Green Building Certifications and Fannie Mae loan data
Installation Cost of Energy and Water Saving Improvements	EY analysis of Fannie Mae High Performance Building Report Data	N/A
Unit-level Affordability, Property Location, and Valuation Data	EY analysis of Fannie Mae loan data and external supporting metrics	EY analysis of Fannie Mae loan data and external supporting metrics
Economic, Social, and Financial Impact Calculations	EY analysis of Fannie Mae loan data and external supporting metrics	EY analysis of Fannie Mae loan data and external supporting metrics

Data source: High Performance Building Report data for green rewards

The primary data source for a Green Rewards mortgage loan analysis is our [High-Performance Building \(HPB\) Report](#),³⁶ which includes an American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Level 2 equivalent energy audit.³⁷ This is prepared by third-party consultants who are engaged by the DUS lender. As part of the energy and water audit, the HPB consultants:

- Gather cost data for the property, including historic utility consumption.
- Establish a baseline of 12-month energy and water consumption.
- Conduct a site visit.
- Model energy and water usage.
- Identify and quantify energy and water efficiency measures (EWEMs), as well as investment opportunities based on the property's equipment age, energy, or water inefficiency, or other factors. HPB consultants generally recommend 10 to 20 EWEMs. All recommended EWEMs must be capital investments that require the installation of equipment, fixtures, or appliances.³⁸

³⁶ Fannie Mae High Performance Building Report: multifamily.fanniemae.com/financing-options/specialty-financing/green-financing/hpb-energy-audit-report.

³⁷ The HPB report instructions and methodology are included within Section 5.09 of our Instructions for Performing a Multifamily Property Condition Assessment (Form 4099): multifamily.fanniemae.com/media/8456.

³⁸ 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 capital investments.

Impact methodology continued

For each recommended energy or water saving property improvement, the consultant assesses environmental and cost metrics, including:

- Total implementation cost to install the improvements.
- Annual projected energy and water cost savings for the borrower.
- Annual projected energy and water cost savings for the tenants.
- Annual projected energy and water consumption savings for the property.

Baseline energy and water consumption data, 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 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 consumption.
- Projected greenhouse gas (GHG) 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 GHG reductions, energy savings projections provided by consultants in the HPB Reports are converted from native units (kWh, therms, etc.) into source energy (kBtu) and associated GHG emissions reductions in accordance with the [ENERGY STAR](#)³⁹ Portfolio Manager methodology. Reductions calculations include conversion factors, which we reflect in Form 4099.H for each loan.⁴⁰ Loans that used a Form 4099.H published before August 2018 use thermal conversion factors from the [EPA Quick Converter tool](#).⁴¹

After the DUS lender (and, in some cases, Fannie Mae) thoroughly reviews 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 program eligibility requirements. Fannie Mae requires the lender to 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 complete the investments within one year of loan closing.

³⁹ ENERGY STAR: energystar.gov.

⁴⁰ See ENERGY STAR Portfolio Manager Technical Reference guides: "Portfolio Manager Technical Reference: Greenhouse Gas Emissions," "Portfolio Manager Technical Reference: Source Energy," and "Portfolio Manager Technical Reference: Thermal Conversion Factors."

⁴¹ ENERGY STAR Quick Converter (Excel download): energystar.gov/sites/default/files/tools/QuickConverter_v2014.xls.

Integral Group Green Building Certification analysis

The primary data source for the estimated impact of loans on properties with eligible GBCs is the Integral Group Green Building Certification Impact Calculator, which uses the type, year, level, and version of each GBC to estimate energy savings, and, in turn, cost and GHG savings for each GBC property. Water savings were not included in the 2019 Impact Calculator.

The Integral Group Impact Calculator is based on a detailed analysis of the program requirements for each certification conducted by Integral Group, an independent energy efficiency and green building consulting firm. Integral Group reviewed each GBC program to identify minimum requirements for each version and type of certification. For example, if a specific version and type of certification requires 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. Integral Group took the following approach:

1. Identify the baseline performance standard based on the property's location. The U.S. does not have a national building energy code; instead, most states have residential and commercial energy code requirements that specify which standard applies for new construction and renovations (ASHRAE 90.1-2010, for example). For new construction in states where there is no statewide energy code, ASHRAE 90.1-2004 is used as the baseline, which is equivalent to the national median energy use intensity for multifamily buildings.
2. Estimate the property's baseline site energy use, using reference energy models published by Pacific Northwest National Laboratory (PNNL) for the appropriate code standard for the state where the property is based. All energy use estimates account for regional climate and property type/size (either gross floor area, or, if not available, number of units). This metric represents the property's baseline energy use based on the applicable energy code.
3. Determine the minimum energy performance mandated by the property's GBC for the applicable performance standard. (The minimum requirement is that the property performs 20 percent better than ASHRAE 90.1-2004 standards.)
4. Estimate the property's anticipated site energy use, using reference energy models published by PNNL along with data from the U.S. Environmental Protection Agency (EPA), the California Energy Commission, and/or the Passive House Institute U.S.
5. Calculate estimated site energy savings by subtracting the property's anticipated energy use from the property's baseline energy use.
6. Calculate estimated carbon emissions savings based on the energy savings using the EPA's Emissions and Generation Resource Integrated Database (eGRID). eGRID contains grid electricity emissions factors by region, derived from the fuels used for generation (e.g., coal, gas, nuclear) and generation capacities, as well as the carbon emissions intensity of using natural gas.
7. Calculate estimated utility cost savings based on the estimated energy savings and the residential rates for energy at the state level, using cost data from the U.S. Energy Information Administration (EIA).

To ensure impact estimates are conservative, all calculations are based on the minimum eligibility requirements of each GBC. If a GBC does not have a minimum performance threshold for energy or water, it is assumed that there was no energy or water impact for securities collateralized by loans on properties with that certification and therefore none are reported. These are represented by "N/A" in the "Environmental Impact per CUSIP" spreadsheets. Fannie Mae no longer recognizes GBCs that do not meet minimum requirements for energy efficiency.

Impact methodology continued

EY analysis

EY estimated the economic, environmental, and social impacts of each security based on the energy and water consumption reductions and associated cost savings, as well as the installation costs of energy and water saving equipment, and construction costs associated with the underlying green mortgage loans. Impacts such as nationwide employment, personal income, GDP, and gross economic output were estimated using the U.S. IMPLAN economic model.⁴²

Financial impacts

- **Direct impacts** account for jobs and economic contribution directly linked to construction, renovation, and installation activities and the related supply of components. For Green Rewards loans, this includes plumbers and other tradespeople, as well as U.S. factory workers who manufactured the components.
- **Indirect impacts** account for supply-chain-linked jobs and economic contributions, such as the manufacturing of materials and components.
- **Induced impacts** account for the economic activity supported by employee consumption. For example, local spending of plumbers and construction workers.

Direct, indirect, and induced impacts are summarized as key metrics as follows:

- **Employment impact** is measured in terms of the number of worker-years-of-activity supported by the spending. Instead of reflecting the number of full-time equivalents for each year, it includes a mix of full-time and part-time workers for each year based on the mix of those worker types commonly found in each industry related to installation or construction activities.
- **Employee compensation/income supported** reflects the total salaries, tips, and other cash and non-cash compensation earned by employees as a result of their employment.
- **U.S. GDP** reflects the industry's value-add, which is equivalent to the sum of payments to labor and capital for each category of economic activity.
- **Contribution to gross economic output** is a measure of the value of the goods and services sold by domestic industries. Economic output includes GDP as well as the industry's cost of operating-inputs (intermediate demand).
- **Construction cost of GBC Buildings** is the sum of the appraised property value, adjusted to remove developer profit, market appreciation, and land value. Values were reduced by 15 percent to reflect expected developer profit and risk on the project. An amount for land value was removed equal to 18 percent of the property value. The value as stated in the property value year was deflated to the construction year to remove overall real estate market appreciation over the period between the construction/renovation/certification activity and the year in which the property value was recorded/provided. The real estate market value deflator is based on Real Capital Analytics' market index.
- **Installation cost** is the aggregate of the cost projected for each property improvement by the HPB Consultant and includes both installation services costs (e.g., plumbing, electrical, carpentry) as well as component costs (e.g., faucet, light fixture, window).
 - Installation service and component costs include labor and installation materials and the cost of components. For example, for the installation of low-flow toilets, the service cost would be the cost of basic materials and the plumber's labor.

⁴² 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 national 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.

Estimated installation service cost and component cost of major improvement categories

Category	EY estimated % installation service cost	EY estimated % component cost
Water and sewer conservation	45%	55%
Lighting	50%	50%
Heating ventilating and air conditioning	33%	67%
Building envelope	30%	70%
Appliances and plug load reductions	20%	80%
Renewable energy systems	40%	60%
Domestic hot water heating	48%	52%
Water and steam distribution	50%	50%
Boiler plant improvements	50%	50%
Advanced controls and metering	50%	50%
Chiller plant improvements	50%	50%
Electric motors and drives	50%	50%

Environmental impacts

- **Energy savings and efficiency** represent the amount of energy in kBtu ascribed to properties backing green MBS. For Green Rewards loans, this represents the difference between the property’s energy usage prior to the energy saving improvements associated with the loan and the projected energy usage after those improvements are completed. For properties with GBCs, this represents the estimated difference in energy usage between the certified property and the property if it were built to the state minimum energy code.
- **Water savings** represents the amount of water in kGal ascribed to properties underlying green MBS. For Green Rewards loans, this represents the difference between the property’s water usage prior to the water saving improvements associated with the Green Rewards loan and the projected water usage after those improvements are completed.
- **GHG emissions avoided** are reported in metric tons (MT) associated with the energy savings ascribed to the properties underlying green MBS.
- **Water-stressed areas** are those with zip codes situated in areas categorized as having “high” or “very high” baseline water stress in the Aqueduct Global Maps 2.1: Constructing Decision-Relevant Global Water Risk Indicators, World Resources Institute, April 2015. Baseline water stress measures the ratio of total annual water withdrawal to average annual available blue water, a commonly used indicator also known as “relative water demand.”

Impact methodology continued

Social impacts

- **Number of units** retrofitted or Green Building Certified is the cumulative number of units in the properties underlying green MBS.
- **Tenant cost savings** are the projected utility cost savings expected to reach tenants of a property with a Green Rewards Mortgage Loan in the aggregate, due to the installation of energy and water saving improvements. These may represent reductions in direct billing or utility expenses where tenants reimburse property owners for utility costs through Ratio Utility Billing or flat fees. Tenant cost savings are not calculated for mortgage loans on properties with GBCs.
- **Total tenant annual income** is estimated using two approaches. The approach used varies by loan and depends on what information is available regarding the number of units at different levels of income.
 - a) For loans that provide the number of units with income limits at various percentages of Area Median Income (AMI), the total tenant annual income is estimated as the number of units at each income level multiplied by the relevant percentage of AMI multiplied by the AMI per the 2017 HUD Section 8 income amounts for the relevant county. This approach assumes that tenants of units at a specified income threshold earn the maximum allowable income for that unit (e.g., tenants of 50 percent AMI units are assumed to earn 50 percent of AMI). This is given by the formula below. All remaining units (those not shown with an AMI maximum) are assumed to have income level equivalent to the top maximum level of 120 percent of AMI.
 - b) For loans that do not provide information about the income level of tenants or income tests for units, all tenants are assumed to earn 120 percent of AMI per the HUD Section 8 income amounts for the relevant county and year. The total annual tenant income for these loans is the product of the number of units and the county AMI by year.
- **Increase in disposable income** reflects the total tenant cost savings divided by the total income of all tenants in the affected buildings.
- **Very low-income units** are defined as units affordable to tenants earning 50 percent or less of AMI.
- **Low-income units** are defined as units affordable to tenants earning 60 percent or less of AMI.
- **Affordable units** are defined as units affordable to tenants earning 80 percent or less of AMI.

Notes and definitions

Refinanced loans are loans where the initial mortgage loan has been liquidated and subsequent financing has been issued for the property. There is one refinanced loan included in the analysis of the 2019 green bond issuances, for which the 2019 green bond issuance is backed by a green mortgage loan that was a refinancing of a previous green mortgage loan. For these loans, impacts are reported for both the security containing the original loan and the security containing the refinanced loan and are calculated against the baseline for each loan.

GeMS are a resecuritization 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 by CUSIP on our public [Green Mission & Impact webpage](#).⁴³

Frequently referenced Fannie Mae webpages

DUS Disclose: mfdusdisclose.fanniemae.com/

Fannie Mae Green Financing Business: fanniemae.com/green

Green Mission & Impact webpage, Green Bond Impact Report, and CUSIP-level impact data file: fanniemae.com/greenimpact

Fannie Mae's Green Building Certification webpage: multifamily.fanniemae.com/financing-options/specialty-financing/green-financing/green-financing-loans/green-building-certifications

Monthly list of green MBS and GeMS REMIC issuances: multifamily.fanniemae.com/financing-options/specialty-financing/green-financing/green-bonds

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⁴³ fanniemae.com/greenimpact.





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