Optimizing Green Capital for Building Decarbonization: A Local Government Financing Strategy for the City of Miami to Redesign Miami Forever Bond

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A capstone thesis paper submitted to the Faculty Director of the Urban & Regional Planning Program at Georgetown University’s School of Continuing Studies in fulfillment of the requirements for Masters of Professional Studies in Urban & Regional Planning.

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ABSTRACT

New building retrofit financing strategies must be explored in the City of Miami in order to reach net zero goals by 2050, specifically for low-income borrowers who usually own the lower performing buildings. The importance of local governments’ readiness to engage with the private sector is essential as a gargantuan $125 trillion investment is required globally to reach emission targets, and due to fiscal limitations within the public sector, approximately 70 percent must be sourced from the private sector. I review both conventional and green financing models as they relate to buildings, compare both models at a municipal scale using Miami Forever Bond, explore how the financial vehicle needs to be different, and provide policy recommendations and innovations that local entities can implement to access green capital for residential building decarbonization efforts. A clearly defined market segmentation must occur so opportunities for impact can be evenly distributed across the market. The building sector often features a long-tail of underperformance which tends to be owned by low credit borrowers, along with a small group of high-performers who are able to fund the green transition. The goal should be to design complementary financing strategies to transform the whole market. I argue that the circumstances of how green capital is used by local governments must be calibrated to offer low income individuals the funds needed to decarbonize buildings.

KEYWORDS


RESEARCH QUESTIONS

1. How do conventional and green financing instruments vary in their design as they relate to residential building development and operations?

2. What residential building types in Miami represent the largest potential for retrofitting and GHG reduction?

3. How can the Miami Forever Bond program be modified to have a significant impact in decarbonizing residential buildings?
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Introduction

As world leaders race to meet climate goals and align their countries to meet Paris Agreement targets, the search for low-carbon solutions in cities must come quickly. It is easy to think of transportation as a substantial carbon emitter, but in fact, buildings and all of the energy they consume are a bigger enemy than transport alone. In the US, the Environmental Protection Agency (EPA) reports that homes and buildings account for over 30% of emissions (excluding embodied carbon). Because buildings are the biggest emitter of carbon, policy makers must find practical solutions to decarbonize existing building stock and implement stringent building codes. Of course, this transition is far from easy and affordable, as the International Energy Agency (IEA) estimates approximately $5.4 trillion will be needed by 2050 to limit global warming below the 2°C mark. Public funding is not enough; therefore, cities must rely on private markets to aid the transition.

It is imperative to find the distinction between conventional and green finance as it relates to buildings. Buildings are capital intensive assets, and the goal should be to design complementary financing strategies to transform the whole market – new and old buildings, commercial, high-income residential owners, and low-income residential owners as well. Green financing is a financial instrument that can provide the funds that cities lack while also addressing the present and future climate crisis. It is a method of funding projects that uphold a “green” requirement—usually accompanied by tax exemption and tax credit as an incentive. Holding the same definition, climate bonds and green bonds exist in parallel. Through the

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voluntary process of green financing, companies, investors, and governments are able to invest in climate-friendly projects, sometimes on favorable financial terms.

Green financing schemes are market transformation strategies, each with discrete purposes and conditions, under which they are effectively serving a theory of change. A straightforward framework must be created to know exactly how the money will fund the transition investments needed to decarbonize cities working with standard assets that need improvement. It is important to direct money and resources to that transition versus current patterns of providing preferred capital to cities and borrowers that have a variety of options for capital. Whether the answer is green finance or not, US cities must be ready to welcome private investment for the decarbonization goals of both new and old buildings.

A new generation of green building policies and regulations at the municipal scale exist, including innovative examples such as the BEPS³ in Washington, DC and BE305⁴ in Miami as part of the City Energy Project⁵, and the Powering Affordable Clean Energy (PACE) program⁶ as part of the Inflation Reduction Act (IRA) to name a few. These initiatives form a new policy framework for designing municipal bond programs. It is possible to create and operate financing instruments that drive positive change in the built environment - accelerating the transition to a


clean, low-carbon economy. The design of these tools requires a multidisciplinary approach integrating urban planning, finance, and environmental science.

I approach this finance topic from the perspective of an interdisciplinary urban planner; I am interested in cross-sector solutions to complex problems and trying to find the most practical way of funding what can drive the most significant difference in carbon emissions while focusing on the financing vehicle as an instrument of change. More than ever, architects, designers, city leaders, state legislators, urban planners, engineers, and developers must be in sync and in conversation about decarbonization goals as they relate to our built environment. It is not just a financing issue, and it is definitely not a one-person, one-organization, nor a one-sector job.

ACKNOWLEDGEMENTS

Thank you to my colleagues in the Transport Unit at the World Bank Group for inspiring me every day, my professors, classmates, and advisors for enriching my knowledge of cities, my close friends and extended family for the endless encouragement, my life partner Marcilio for believing in me more than I believe in myself, and Diana and Rolando, mamá y papá, for loving me unconditionally.
Literature Review

Assessing what defines a green building is not as straightforward as one would hope, as it depends on various factors: energy consumption, fuel type, usage/occupancy, construction material used, life cycle of materials, and energy efficiency measures. As the importance of building decarbonization becomes more prominent, technological innovations help third party certifiers and organizations that aim to reduce GreenHouse Gas (GHG) emissions, benchmark outcomes as they relate to reduction targets in the building sector. Retzlaff’s research explains differences between building assessment systems and the variety of different results they can produce. These differences include the scales in which different issues are assessed, emphasis on communication, the prioritization of concerns, and the lack of replicability for adaptation to local conditions.7

Of course, building assessments are simply one part of the equation, and climate action plans must be agreed upon, enforced, and implemented to achieve successful environmentally forward projects. In a review of climate action plans of 29 US cities, one study pointed out that these plans cannot be truly successful as they lack an emphasis to include dense development, parking restriction policies, and broad strategies that reduce building energy consumption.8 These goals cannot be realized if state legislation is not aligned with climate actions plans as cities are ultimately preempted by the state in cases such as building codes.

As researchers Leibowicz, Lanham, Brozynski, Vázquez-Canteli, Castejón, and Nagy describe when discussing decarbonization pathways, carbon reduction measures cannot be


separated from building energy efficiency standards as the dominant strategies for decarbonizing urban residential building energy services are the electrification of energy end-uses and electricity generation. Professional associations today understand these complexities and emphasize the imperative of rethinking the role of existing buildings in the broader challenge to decarbonize cities and economies. US Green Building Council (USGBC), for example, has committed to transforming the building stock by influencing their design, construction, and operations through Leadership in Energy and Environmental Design (LEED) - the most widely used green building rating system. The work of the Urban Land Institute Net Zero Imperative initiative has provided technical assistance globally to reduce carbon emissions associated with buildings, communities, and cities, acknowledging the importance of awareness and general involvement. The contribution of the American Institute of Architects towards Zero-Carbon and its emphasis on architects' involvement in tackling embodied carbon speaks to the importance of the multi-sectoral approach in meeting climate targets.

As finding solutions to the changing climate is not possible without constant data reporting and scalable technology solutions, it is noteworthy to highlight the work of

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McKinsey’s Catalyst Zero and their recent collaboration with Microsoft to create data intelligence for decarbonization planning. Globally, The Word Bank (WB) Treasury has also done important work and has been at the forefront of innovating global markets for over 70 years. The WB Treasury showcases numerous reports and resources with takeaways, beginning with the 2022 Sustainable Development Bonds and Green Bonds report, proving how Paris Alignment is possible.

Tackling the climate crisis involves wide-reaching investments to achieve green infrastructure transformations. Understanding this monetary imperative, C40 Cities (C40), a global network of over 100 mayors around the world, is committed to confronting the climate crisis by scaling up climate action. They facilitate access to finance by supporting cities in divesting their pensions and investment from fossil fuels to green climate solutions.

Municipalities vary in their ability to allocate budgets and attract external finance. They are restricted by national policies, institutional capacity, and taxation powers, limiting their access to private investment. With programs like C40 Cities Finance Facility (CFF), Urban


Shift\textsuperscript{18}, and Divest / Invest Forum\textsuperscript{19} C40 strives to speed and scale sustainable investments. Additionally they partner with Global Covenant of Mayors for Climate & Energy, the City Climate Finance Leadership Alliance (CCFLA), International Council for Local Environmental Initiatives (ICLEI) and World Resources Institute (WRI) to scale financial opportunities.\textsuperscript{20}

While it is evident innovative financing is needed for decarbonization efforts, results from a Brookings study finds that it is not clear how cities plan to pay for needed infrastructure improvements to reduce GHG emissions. According to the analysis, only 70\% of cities integrated details of funding and financing into their decarbonization strategies, with only 66\% identifying existing funding sources.\textsuperscript{21} At the investor level, they are less familiar with municipal government structures and financial conditions, making it difficult to find a pipeline for scalability.\textsuperscript{22} A co-publication of WB and United Nations Development Programme (UNDP) describes how meeting the need will require creative investment vehicles for leveraging large

\begin{footnotesize}
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volumes of capital, including the expansion of municipal green and resilience bonds. However, cities operate in various enabling environments and conditions. As the 2021 State of Cities Climate Finance report states, “cities should leverage municipal own source revenue as a tool to create fiscal space for city climate investments” enabling pricing mechanisms at the municipal level.

Key takeaways:

- Buildings are carbon heavy assets with complexities that extend beyond their built form– ownership, location, operations, energy usage, governing bodies, and financial capacity.

- Building decarbonization efforts must encompass a wide range of support from multi-sectoral professionals with focus on data collection, financial capacity, and institutional capacity building. Without a holistic approach to the issue, action plans are weak by design.

- Getting to carbon neutrality is very expensive, which is why cities must create context specific solutions that are equitable while incorporating financial plans in parallel to their climate action plans. State and local governments have the power to catalyze innovations to scale decarbonization products.

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23 Lauren, Sandrine, Catalyzing Private Sector Investment in Climate Smart Cities, 47.

Professional Best Practice Review

Across the country, city leaders and organizations have established programs and frameworks to enhance the energy efficiency of buildings to reach net zero goals. New York City has established the New York City Energy Efficiency Corporation (NYCEEC), which is a dedicated municipal finance program targeting existing buildings. The program has financed nearly $100 million in clean energy projects, eliminating over 629,000 metric tons of greenhouse gasses.25 In the District of Columbia, The Green Building Act of 2006 (GBA) requires all non-residential buildings to meet USGBC’s LEED certification standards.26 Climate Bond Initiatives, globally known for their expertise in green financing, recently released their 2022 State of the Bond Market Report27 highlighting green, social and sustainability (GSS) markets, sustainability-linked bonds (SLBs), and transition bonds, describing the shape and size of these debt markets and its potential. Additionally, Rocky Mountain Institute (RMI) has worked to improve America’s energy efficiency since 1989; the Institute has also initiated programs such as REALIZE in California and Massachusetts aiming to catalyze the zero carbon residential revolution by establishing retrofit delivery programs across the country.28


Other excellent tools are the creation of EDGE Buildings by the International Finance Corporation\textsuperscript{29} and tallyCAT\textsuperscript{30} a climate action tool by Building Transparency, both with built-in climate data that allows optimal low-carbon design for buildings and homes. In the real estate space, accompanied by a new innovative investor model, Galvanize Climate\textsuperscript{31} aims to buy low-density multifamily real estate and upgrade these buildings to be more energy efficient. Lastly, BlocPower, a climate technology consultancy company that analyzes, finances, engineers, and helps in the construction phase of building upgrades, aims to enhance the green economy through property retrofits.\textsuperscript{32} Cities can indeed procure or design models that replicate these initiatives to enhance their buildings to become more energy efficient, collect data in the most productive way, and provide top-down solutions to catalyze building transformation at scale. The nature of these endeavors is complex and context specific; therefore, it is an important point of market intervention to understand how these assets work and how they can be retrofitted, optimizing not just conventional instruments, but green instruments as well.

Key takeaways:

- Experts understand the imperative of decarbonization, specifically for our building stock, and many technological innovations currently exist that can aid local leaders to find solutions.


\textsuperscript{31} Galvanize Climate Solutions, "Galvanize Real Estate," \textit{Galvanize Climate Solutions}, July 2023, https://galvanizeclimate.com/investment-strategies/real-estate/.

City leaders must engage and collaborate with national and international governments to exchange knowledge on best practices, as many have found creative ways to tackle the issue. These innovations can be replicated to fit local realities.

**Research Methodology**

First, an analysis of conventional and green financing models is made using Climate Bonds Initiative, The World Bank, International Finance Corporation, US Environmental Protection Agency, and Smart Cities Council resources. Dominant housing financing strategies are found through literature and an interview with a top executive at Rocky Mountain Institute. An analysis is made of the state of climate measures in the City of Miami through the 2018 Greenhouse Gas Inventory, Miami BE305 benchmarking program, Miami Forever Carbon Neutral report, and Florida energy legislation. This analysis is compared to Miami Forever Bond (MFB) based on data from Miami Dade’s Office of Capital Improvements, Miami Forever Climate Ready, and an interview with MFB citizen’s oversight board. Next, using data from Seattle, Boston, New York City, and Miami through public tableaus by salesforce, Boston data hub, Seattle energy benchmarking data collection, Urban Green Council, American Community Survey data, and public housing data from Miami, an analysis is made to find best buildings for retrofits. Lastly, a re-model of MFB is envisioned using data collected from this research.

**Research Chapter 1: Conventional Financing vs. Green Financing for Residential Buildings**

To recognize the leverage of green financing, it is important to understand its nuances and potential and compare it to business-as-usual financing. Table 1 lists financing tools available for private investors, homeowners, and cities in residential construction:
Table 1: Financing Options for Residential Construction

<table>
<thead>
<tr>
<th>Conventional Building Financing</th>
<th>Green Financing Options</th>
<th>Other Financing Options for Cities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction Loan</td>
<td>Green Bonds</td>
<td>General Obligations Bond</td>
</tr>
<tr>
<td>Real Estate Crowdfunding</td>
<td>Green Finance</td>
<td>Revenue Bonds</td>
</tr>
<tr>
<td>Money Partners</td>
<td>Transition Financing</td>
<td>Industrial Revenue Bond</td>
</tr>
<tr>
<td>Housing Tax Credit</td>
<td>Energy Service Agreement (ESA)</td>
<td>Public Benefit Bonds</td>
</tr>
<tr>
<td></td>
<td>Capital Lease Agreement</td>
<td>Energy Efficiency Loans</td>
</tr>
<tr>
<td></td>
<td>R-PACE Loan</td>
<td>Greenhouse Emissions Allowance Auctions</td>
</tr>
<tr>
<td></td>
<td>Power Purchase Agreement (PPA)</td>
<td>Developer Dedication Requirements</td>
</tr>
<tr>
<td></td>
<td>Green PreDevelopment Loan</td>
<td>Linkage Fees</td>
</tr>
<tr>
<td></td>
<td>Green Rewards by Fannie Mae</td>
<td>Public-Private Partnership</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Securitization and Structured Finance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Loan Loss Reserve Fund</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Loan Guarantees</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pooled Bond Financing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Value Capture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Philanthropic Opportunities</td>
</tr>
</tbody>
</table>

Source(s): Adapted from Smart Cities Financial Guide by Center for Urban Innovation at Arizona State University and Smart Cities Council.

All models listed above are debt instruments and must be repaid in full with interest over time. Additionally, while the building owner owns all equipment, they are also responsible for maintenance, including verifications by technicians. The financial packages offered by green financing have the caveat of having environmentally-driven goals, catalyzing the green

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transformation. Though both are securitized by debt, green financing tends to offer lower interest rates and a wider pool of private investors not looking for quick returns.

A bond can be issued by a corporation, a municipality, the federal government, or government-affiliated associations as debt security sold to investors. In a traditional bond, the security of the bonds is measured by the payment ability of the borrower making corporate bonds riskier than, for example, government bonds. When comparing transition finance to green finance, the overarching difference between them is that they are similar in scope but hold different objectives. Transition finance supports broader sustainable efforts while green finance is tied to a specific green outcome.

Local governments tend to be structurally cut out of green capital because they lack the technical capacity to align their goals to that of investors looking for sustainable changes – whether that is through the mismatch of wording used in city-wide strategies or unproductive procurement and due diligence. Local entities are often not familiar with the capabilities and options these financial tools offer, making it difficult for investors to navigate and align their investment goals. Oftentimes, investors themselves end up estimating the emission outcomes of the projects they are investing in because governments do not have the available data. This additional work comes at an extra cost for the investor, who is already injecting capital into a project. On the other hand, because technology is moving incredibly fast, there are many physical and financial technologies and innovations that are quickly moving beyond early adopters and into the early majority as climate solutions become of the essence. Because of this, it is important to also group all of the available resources, data, tools, and programs in one place that is easily accessible to all. This would facilitate collaboration among stakeholders with industry trailblazers as we all find solutions to decarbonize the built environment.
With the large pool of financing tools available, both for business as usual and green financing, a financial segmentation needs to occur so specific tools can target homeowners that cannot assume further debt to retrofit their homes to reach max energy efficiency. In the housing context, there are two dominant strategies for the residential housing market to retrofit as seen in Figure 1: Fannie Mae and REALIZE by RMI. The former incentivises higher-performing buildings or retrofits and the latter targets low-performance, multi-family homes and creates an improvement package for them.

Figure 1: Dominant Financial Strategies in the Housing Market

Not all of these tools are available to every jurisdiction, nor are they appropriate for every project, but they must be highlighted and used as a template to allow creative financing strategies. A program like Green Rewards by Fannie Mae\textsuperscript{34} is an excellent tool; however, it takes a national approach, making it weak by not having a direct relationship to the borrower and not targeting the circumstances of, for example, Miami nor their building stock. By targeting low

middle income (LMI) housing, REALIZE offers a scalable city specific retrofit package by targeting a distinct housing typology that optimizes context specific scenarios. In other words, Fannie Mae targets market rate borrowers and REALIZE targets low income borrowers. It is important to note that existing financing strategies represent complementary and differentiated market interventions. A market segmentation of these financial tools must occur to transform the whole market.

Research Chapter 2: GHG Reduction Measures in the City of Miami

The City of Miami’s 2018 greenhouse gas inventory report serves as the first inventory in over a decade (last one realized in 2008 with baseline years of 2006 and population growth of 16.5% since then), informing the new climate action plan of the City to reach carbon neutrality by 2050.\(^\text{35}\) The Global Protocol for Community-Scale Greenhouse Gas Inventories (GPC) was used for their greenhouse gas reporting as required by the C40 Cities Network. As seen in Figure 2, commercial and residential buildings produce 52 percent of citywide emissions powered by electricity and natural gas. It is important to note that the 7 percent emissions produced by solid waste and water are from residents and industrial processes, adding to the emissions pool for buildings. Figure 3 shows that 59% of the building stock in the City of Miami is residential, making an interesting case for the power of focusing decarbonization efforts towards residential buildings.

The 2018 inventory report compliments Miami Forever Climate Ready, the City’s climate adaptation plan in their data driven solution goals. Within this plan, there are two initiatives that relate to buildings: Building Efficiency 305 (BE305)\textsuperscript{36}, an energy benchmarking program, and the Keep Safe Miami\textsuperscript{37} program providing energy efficiency audits to affordable housing buildings. Both of these programs are volunteer based, and Keep Safe Miami has a limited capacity with no guarantee of all applications being accepted. Information collected from an interview with a BE305 program representative indicated that the City of Miami is prioritizing larger commercial buildings first. Additionally, BE305 does not offer a financial component.

In parallel to Miami Forever Climate Ready, Miami Forever Carbon Neutral is the City’s Greenhouse Gas Reduction Plan and Pathway to Carbon Neutrality by 2050, which aims to achieve a 60% emissions reduction by 2035. Precisely, Goal 2: Renewable Energy, aims to make


Miami’s electricity sources 100% carbon-free by 2025 which aligns with the Biden’s administration carbon-free electricity nationwide goals as well as the Miami Dade County’s.\textsuperscript{38} According to the Greenhouse Gas Reduction Plan, Florida Power and Light (FLP), responsible for most of electric power generation in Florida, will be 37% carbon free by 2029.\textsuperscript{39} Though the State of Florida passed legislation in 2021 limiting local power the ability to influence utility fuel sources for energy production\textsuperscript{40}, there are other ways to encourage a carbon free transformation at the individual level.

Google Environmental Insights Explorer Program\textsuperscript{41} has chosen the City of Miami as one of the cities to develop and deploy rich environmental data that will assist Miami implement their carbon free agenda. Greenhouse Gas Reduction Plan’s PHASE 2: 4-6 years (\textit{significant progress by end of 2026}) aims to: a) adopt building performance standards for commercial, multi-family residential, and City of Miami municipal buildings over 20,000.00 sq. ft., and b) establish residential, single family home energy conservation requirements.\textsuperscript{42}

Figure 4 illustrates the amount of GHG emissions from buildings forecasted until 2050 in the City of Miami. It is evident that reducing GHG emissions from the building sector is essential to the City of Miami, and they have taken multiple efforts to embark on the energy

\begin{itemize}
\item \textsuperscript{39} The City of Miami, Miami Forever Carbon Neutral, 25.
\item \textsuperscript{40} Florida Energy Efficiency and Conservation Act, H.R. 366.032, 2021.
\item \textsuperscript{41} Google Environmental Insights Explorer, “Build a resilient, sustainable future for your city or region,” Google, 2023, https://insights.sustainability.google/.
\end{itemize}
transformation beginning with commercial buildings. However, there is a significant opportunity to target medium multi-family properties as they are more carbon intensive than larger ones. Figure 5 shows the reduction pathway planned for the City of Miami, with a high concentration of efforts going to electricity generation. There is much opportunity left for increasing the blue shading in Figure 5, representing building efficiency and fuel switch.

Figure 4: City of Miami Greenhouse Gas Emissions Forecast: 2018-2050

Source: Miami Forever Carbon Neutral.

Figure 5: City of Miami Greenhouse Gas Reduction Pathway

Source: Miami Forever Carbon Neutral.
Research Chapter 3: Miami Forever Bond

The Miami Forever Bond (MFB), a $400 million general obligations bond, was approved in November 2017 by the City of Miami to fund a series of projects mostly addressing sea-level rise and flooding concerns. The bond is divided into five categories: parks and cultural facilities, roadways, sea-level rise and flooding prevention, public safety, and affordable housing. It was executed in three phases: immediate impact, gain momentum, and long-term solutions. The first phase was divided into two series to address infrastructure and affordable housing.

Figure 6 illustrates the distribution of MFB. The bond will be repaid through a 3% property tax rate assessed on City residents’ tax bill. This was possible without a tax increase burden to residents due to the City’s positive history of paying off previous debt. Following the analysis offered by chapter 1, MFB does not follow a transition financing model when looking at its goals in the capital improvements website. However, when looking at the Miami Forever Climate Ready 2020 Strategy, they outline their goals as being climate forward, making the case that it does follow a transition financing model and can potentially follow a green financing model as well if it is re-designed. An important innovation of the MFB is that they prioritize low income neighborhoods.

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Figure 6: Miami Forever Bond

Source: Miami Forever Climate Ready 2020 Strategy.

Within the 100 million allocated to affordable housing, table 2 shows the current state of project allocations and funding. All of the projects shown in table 2 are in the request for proposal (RFP) stage. At large, it aims to improve affordable housing availability while leveraging funding sources and partnerships.

Table 2: MFB Tranche 1 Projects

<table>
<thead>
<tr>
<th>Project</th>
<th>Description</th>
<th>Project #</th>
<th>District</th>
<th>Bond Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction and Permanent Financing: MLK Residences</td>
<td>Reimbursable Allocation to developer (Atlantic-Pacific). Supported by City RFP and land parcel contribution</td>
<td>5</td>
<td>$2,000,000.00</td>
<td></td>
</tr>
<tr>
<td>Construction and Permanent Financing: Liberty Renaissance</td>
<td>Reimbursable Allocation to developer (Centennial). Supported by City RFP and land parcel contribution</td>
<td>5</td>
<td>$1,000,000.00</td>
<td></td>
</tr>
<tr>
<td>Affording Housing and Economic Development</td>
<td>Allocation of funds for the construction and preservation of affordable and workforce housing to be selected as a result of an RFP process.</td>
<td>CW</td>
<td>$8,000,000.00</td>
<td></td>
</tr>
<tr>
<td>Home Ownerships Preservation / Single Family Home Rehabilitation</td>
<td>Provides rehabilitation assistance to City of Miami homeowners, with repairs necessary in bringing the home to decent, safe and sanitary conditions, as well as to include materials and methods that harden the property to better withstand natural weather occurrences as well as to maximize the energy efficiencies of the home.</td>
<td>CW</td>
<td>$4,000,000.00</td>
<td></td>
</tr>
</tbody>
</table>

Source: Approved Project, City of Miami MFB.

Though MFB does not have a direct investment profile on building decarbonization, there is a way to calibrate it. The following chapter captures the potential of MFB in utilizing more
capital to achieve residential building decarbonization goals through the affordable housing funding allocation of MFB.

**Research Chapter 4: Research Findings - Most Promising Building Stock for Retrofits**

According to research from New York City, medium multifamily properties are more energy and carbon intensive than larger ones due to their high fuel use; therefore, they are consuming more energy than other housing typologies. In addition, homes built prior to and during the 1940s use onsite fuel heating, making them a promising target for retrofits. Figure 7 and 8 showcase the fuel use intensity and distribution for multifamily properties in New York City:

**Figure 7: 2017 Multifamily Fuel Use Intensity**

**Figure 8: Emissions Intensity Distribution**

Source: Urban Green Council.

The darker blue squares on Figure 7 illustrate homes built before and around 1940. Those represent the most energy use intensity, making them a promising target for retrofits. Figure 8

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provides a visual representation of the increase of emissions intensity as it relates to medium multifamily. The building sector often features a long-tail of underperforming buildings (right side of Figure 8) who tend to be owned by low credit borrowers, along with a small group of high-performers (left side of Figure 8) who tend to be owned by borrowers with many options for capital. According to experts and data collected in Boston\textsuperscript{46}, Seattle\textsuperscript{47}, and New York City,\textsuperscript{48} cities typically have this profile of energy consumption across their housing stock and data remains heterogeneous all throughout. Using the two dominant financing housing strategies from chapter 1 as examples, Figure 9 provides a visual of how the two strategies described would intervene in the market.


\textsuperscript{47} Seattle Office of Sustainability and Environment, “Seattle Energy Benchmarking,” \textit{Office of Sustainability and Environment}, 2023, https://www.seattle.gov/energybenchmarkingmap/#seattle/2021?categories%5B0%5D%5Bfield%5D=property_type&categories%5B0%5D%5Bother%5D=false&categories%5B0%5D%5Bvalues%5D%5D=High-Rise+Multifamily&layer=total_ghg_emissions_intensity&sort=total_ghg_emissions_intensity&order=desc&lat=47.61293&lng=-122.32478&zoom=14.

A market segmentation of these financial tools must occur. Opportunities for impact are not evenly distributed across the market, and the goal should be to design complementary financing strategies to transform the entire market. The innovation this research brings forward is to highlight the importance for money to be funneled to low income residential units. Due to lack of residential housing data from the City of Miami, this research assumes that the City of Miami’s housing stock follows a similar pattern to that of New York, Boston, and Seattle. Acknowledging that Miami follows different weather patterns than the three cities listed above, there is still something to be said about the energy use intensity of older residential units, who owns them, and the financial gap that exists.

Figure 10 illustrates where the city has the most potential for building retrofits. The red and orange blocks represent buildings built in and before 1950, and the gray dots represent where
Miami zoning allows for urban zones under their form based zoning.\textsuperscript{49} In addition, this highlights the importance of the scalability needed for retrofits in older homes built before and around 1940 in the City of Miami.

Figure 10: City of Miami Vintage Bin


Figure 11: City of Miami Vintage Bin + Public Housing


Planning Recommendations: A Redesign of MFB to Decarbonize LMI Residential Stock

One of the five goals MFB addresses affordable housing with the goals of: a. creating and preserving affordable housing units, b. increase employment opportunities, and c. deliver assistance to existing and new businesses. At large, it aims to improve affordable housing availability while leveraging funding sources and partnerships as stated in the Capital
Improvement website.\textsuperscript{50} There is a particular extra bullet on the Miami Forever Climate Ready 2020 Strategy report under the Affordable Housing goal of MFB that reads: “Increase the number of homes hardened to be more resilient”\textsuperscript{51} and that is what this chapter hones into.

As previously mentioned, individuals that own the lower performance buildings are the ones who need credit support the most but are not the greatest borrowers. As shown in Chapter 4, they are owning and living in relatively low-performing multi-family homes in Miami. NGOs such as Miami Homes for All\textsuperscript{52} or SELF\textsuperscript{53} serve those that are not credit worthy by funneling loans with very low interest rates. As seen in Figure 12, the redesign of MFB would allow a greater amount of capital to be distributed to lower performing buildings and those living in affordable housing with no need of repayment.

First, a retrofit Package\textsuperscript{54} is designed based on housing typology, followed by the breakdown of the cost. The cost can be identified by a third party who would be hired by the City. For best pricing of contracting, the City can use the existing network of Community Development Financial Institution (CDFIs), SELF in the case of Miami, who already have a built

\begin{itemize}
\item \textsuperscript{52}Miami Homes for All, “Everyone deserves a safe, affordable place to call home,” Miami Homes for All, August 2023, https://www.miamihomesforall.org/
\item \textsuperscript{53}SELF, “Home Improvement Loans,” SELF Creating Sustainable Communities, July 2023, https://solarenergyloanfund.org/home-improvement-loans/.
\end{itemize}
relationship with contractors, and are most familiar with the current context. Next, the City can stack incentives from IRA and other state and federal tax credits (energy rebates for example) with subsidies the MFB would provide (including green bonds, as well as utility rebates\textsuperscript{55} in the future). Lastly, while the property owner waits for the money, the Greenhouse Gas Reduction Fund\textsuperscript{56} (GGRF) can be used as a 0 percent interest bridge loan from CDFIs, who can apply for GGRF funding and use it as debt. This way the city does not have to rely on state legislation for federal funding. MFB can count with green capital within their housing affordability objective by providing a subsidy by right based on EUIs as their building stock slowly gets retrofitted and becomes more energy efficient.

By focusing on low income neighborhoods first, MFB already has an advantage to continue growing their program to become more equitable and diverse with a finance strategy at its core. With measurable targets backed by continuous data collection, a clearly defined market segmentation, a financial instrument framework that can work at scale for the net zero transition in the building sector can be possible.


Conclusion

The circumstance of how green capital is introduced into the building decarbonization space must be calibrated to offer low-performing residential buildings, usually owned by low credit rating borrowers, the leverage of green finance to fund building retrofits securitized by local government funding. The City of Miami can reconfigure the Miami Forever Bond in a manner conducive to a broader pool of private capital. In this way, they can fund the green transformation needed to meet climate goals while including those that cannot assume additional debt to upgrade their homes. The time for municipalities to get creative with financing mechanisms to fund climate-resilient transformations while leveraging private sector innovations and expertise is now.
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