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Financing Green Building in Residential Development

Financial Innovations Lab® Report

המשרד להגנת הסביבה
الوزارة لحماية البيئة
Israel Ministry of Environmental Protection

Jerusalem Institute
Milken Innovation Center

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Financial Innovations Labs bring together researchers, policymakers, and business, financial, and professional practitioners to create market-based solutions to business and public policy challenges. Using real and simulated case studies, participants consider and design alternative capital structures, and apply appropriate financial technologies to them.

About the Milken Innovation Center

The Jerusalem Institute for Policy Research-Milken Innovation Center focuses on developing market-based solutions to Israel’s greatest challenges as it transitions from a startup nation to a global nation. Our work leads to innovative policies and programs, and financial technology transfer, that democratize capital, finance ideas, create jobs, and accelerate economic growth. The Center’s work focuses on how to accelerate sustainable economic growth, build human capital, and cement Israel’s role as a pioneer in addressing global challenges in water, food, education, health, and energy with solutions that others can replicate.

Contents

EXECUTIVE SUMMARY

Buildings are responsible for nearly 60 percent of Israel's electricity consumption and contribute 28 percent of the country's total greenhouse gas emissions. These statistics, from the Ministry of Environmental Protection, highlight our relative shortcomings: worldwide, on average, buildings account for just 32 percent of electricity consumption and contribute to 19 percent of greenhouse gas emissions.

We know now from studies that energy-efficient construction lowers mortgage risk default in both residential and commercial real estate[1]; new technologies are bringing down capital costs; and paybacks are improving for private investments in energy efficiency for both owners and tenants.

With recent initiatives to invigorate the residential construction market, the government is particularly well positioned to help make "green building"—the use of environmentally friendly systems and technologies—financially attractive for developers, home buyers, and investors. The slow adoption to date of green construction illuminates an undeniable market failure that an active policy role can remedy.

This report looks at the existing market barriers in Israel, as well as the country's greatest assets, which include the advantage of a sunny climate and our reputation as a world leader in cleantech. Our young companies have developed astounding products in the areas of solar power, smart metering, grid management, insulation, building materials, remote sensing, big data collection, and water-savings technologies. Yet many of these companies can't find traction where we need them most: at home, in our local market. The Financial Innovations Lab looked at financing obstacles and opportunities, and came away with detailed recommendations for tax benefits, loan subsidies, rebates and discounts, performance-based financing, and regulatory relief. These factor into the proposed creation of a NIS 3 billion Green Fund to leverage over NIS 11 billion in financing for more than 85,000 green apartments, and lead directly to an estimated 1.5 percent annual reduction in Israel's greenhouse gas emissions.

The result will be a stronger business sector offering sustainable green building solutions, financially feasible green building systems, and lowered operating costs for consumers, all of which will bring us much closer to reducing our carbon footprint and address climate change.

INTRODUCTION

Commercial and residential buildings are responsible for about nearly 60 percent of the Israel's electricity consumption and contribute 28 percent of our total greenhouse gas emissions.[2] These statistics, from the Ministry of Environmental Protection, should make us sit up and take notice; worldwide, for example, buildings generally account for 32 percent of electricity consumption and on average contribute to 19 percent of greenhouse gas emissions.

This reality has led the government to recognize the importance of the "green building" market. Green building (also known as green construction or sustainable building) refers both to a process—with "green" project development and construction methods, and the installation of "green" systems—and the resulting product: an energy-efficient structure. With the public push to lower greenhouse emissions, developers and consumers alike are looking for ways to improve energy efficiency and lower the carbon footprints of the buildings they erect or inhabit, and the government is looking for ways to move them along faster.

Studies show that energy-efficient construction lowers mortgage risk default in both residential and commercial real estate[3]; new technologies and techniques, meanwhile, are lowering the incremental capital (marginal) costs; and paybacks are improving for private upgrades in energy efficiency, for both owners and tenants. But the adoption of green systems and green building isn't keeping pace with opportunity or innovation; while 3000 green residential units were built in 2014, those units made up just 7 percent of that year's total residential construction. What might explain this gap?

One trend we see is that Israelis are building larger, more expensive, and more energy-intensive homes, increasingly situated in suburban and outlying areas. Another trend is that over the past decade, the housing market has grown too hot and too expensive with prices rising again this past year another 9% for homes overall and over 14% for new construction. The average tenant and/or hopeful homeowner can't find an affordable, conveniently located real estate market, much less affordable energy-efficient upgrades that would lower long-term operational and maintenance costs. It's difficult to plan a future in an uncertain present, and most Israelis must contend with dual obstacles: relatively flat adjusted incomes and dramatic annual rises in housing prices. The government is currently pursuing a range initiatives to accelerate home construction to meet demand, including affordable housing; in light of these efforts, now is also the appropriate time for it to consider an active policy role in leveraging private investment in green building. This will help reverse the undeniable market failure emerging from the slow adoption of green building.

Israel is only just beginning to look at tools for leveraging private investment, yet the Milken Innovation Center estimates residential energy efficiency has the potential to leverage private investments in the economy by an estimated three times the initial public investment.

This report looks at ways to make green building affordable, both for developers and the end users. It also introduces the financial tools that can help fill investment gaps along all links in the building value chain, from the developer to the resident.

Israel is well positioned to explore our recommendations for financing options. We have the advantages of climate and are home to numerous robust young companies that are developing passive and active solar power, smart metering and grid management, efficient insulation, building materials, and water-savings technologies applicable to commercial, agricultural, and residential markets. Israel ranks first globally in clean technology innovation, according to the Cleantech Group's global index.[4] Our Information Technology (IT) sectors are leaders in design and programming for the Internet of Things, which feed the green building sector in areas like monitoring, remote sensing, big data collection, and real-time systems adjustments. Yet even though Israeli companies create new and compelling economic opportunities, paradoxically, they have a hard time getting traction in the local market.

To this end, the Milken Innovation Center convened a Financial Innovations Lab in October 2015 at the Jerusalem Institute. Sponsored jointly by the Ministry of Environmental Protection and the Jerusalem Institute for Policy Research/Milken Innovation Center, the Lab's goal was to design a series of policy and program proposals aimed to help the deployment of green building technologies in residential construction—and to find ways to accelerate the pace at which these financial initiatives and tools are adopted. The initiative is part of the Ministry of Environmental Protection's comprehensive planning and policy work.

The Milken Innovation Center, together with a steering committee from the Ministry of Environmental Protection, seeks to use comprehensive, scalable, efficient financial solutions to open and strengthen financial sources from capital markets. Participants design solutions to identify, capture and leverage increases in values and new revenues, and increase competition to provide services and solutions wherever possible. Most important, they recommend policies that raise the level of accountability and transparency at the local and regional levels, and among business sectors. Thus, the Lab had specific objectives:

- Focus on the market failure of the building industry in using green building techniques and practices.
- Identify the economics of green building techniques used successfully in other markets and in Israel.
- Analyze the financial and economic costs and benefits of these practices.
- Design incentives to accelerate the adoption of best practices in Israel, and the policy and program structures that can deploy these incentives.

More than 50 policy, industry, technology, and finance professionals from Israel and abroad attended. Participants had experience and expertise in green building, construction, residential financing, and local, regional, and national regulations. The Lab produced several recommendations for financial approaches that can be developed with special tools, including:

- Tax benefits: to increase the return on equity for direct capital investments in green technologies.
- Loan subsidies: to lower the cost of debt with more flexible terms and to shift risk from conventional debt sources.
- Discounts and rebates: provided by suppliers to contractors and consumers to encourage adoption of new green technologies.
- Performance-based financing: to provide financing based on the efficient technologies, lower operating costs, and increased cash flow for the consumer that can be used to pay for the initial capital investment.
- Regulatory relief: to provide adjustments and allowances in the building plans and systems for the contractor, including accelerated permitting for energy efficient building plans.

The Lab offers recommendations for tailoring these financial tools and approaches for both new construction and renovations, and for the structure of a sustainable model. To this end, the Lab proposed the creation of a NIS 3 billion Green Fund to leverage over NIS 12 billion in financing for more than 50,000 green apartments, and would lead directly to an estimated annual 1.5 percent reduction in Israel's greenhouse gas emissions. The result will be a stronger business sector for offering sustainable green building solutions, the adoption of financially feasible green building systems, and lower operating costs—and each component will contribute to lower overall energy use and a reduction of our carbon footprint.

ISSUES AND CONTEXT

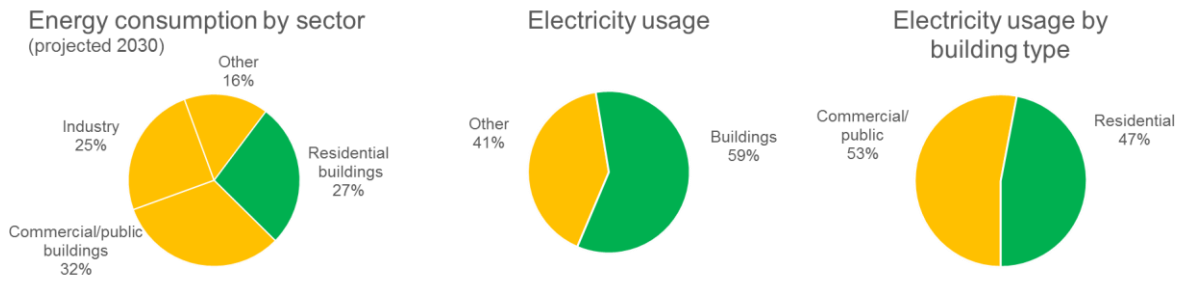
Green building is an increasingly important part of the construction industry for commercial and industrial projects. New technologies, including materials, building systems, mechanical systems, energy sources, and smart metering, are being developed and implemented worldwide. Already 85 percent of all dwellings in Israel use passive rooftop solar water heaters[5], lowering individual household energy use for hot water by an estimated 2,000 kWh per year per household.[6] (The average Israeli household consumed about 5,844 kWh in electricity in 2014, according to the World Energy Council.[7]) While green technologies can add an estimated 1–4 percent premium in construction costs, depending on the scope of the green improvements, they also yield savings to the home's operating and maintenance costs, allowing for a payback of the initial capital investment in less than ten years, according to Lab participants.

Economic and environmental impacts

The construction sector worldwide accounts for 10 percent of global GDP, with direct and indirect impacts on the environment. The sector produces 33 percent of global greenhouse gas.[8] In Israel the impacts of energy consumption to produce heat, light, and cooling are even more apparent. Residential construction already represents over 30 percent of the gross fixed capital formation overall, and just over 60 percent of the value for all construction in the country, and .02% percent of Israel's GDP.[9]

Private residential development represents a significant opportunity for green construction technology growth. An estimated 45,000–65,000 new homes are expected (and needed) per year over the coming years—of which 96 percent would be new buildings and just 4 percent new apartments within existing buildings. This represents almost NIS 58 billion in new construction, and a potential for over NIS 1 billion in green technologies implemented in construction per year.[10] This incremental expenditure in green technology could add an estimated extra 3,000 construction jobs per year.[11] Renovations and retrofits of existing housing stock (on the aging 2.4 million dwellings nationwide in 2015) are also expected to increase, adding further to the economic impacts of the housing market in Israel.

FIGURE 1 Electricity use in Israel

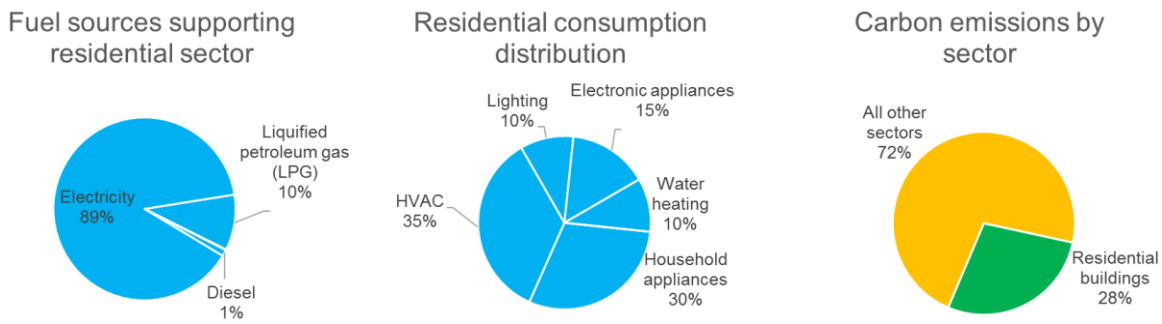


Source: Milken Innovation Center

The energy-water nexus represents another potential area of savings. Households account for 36 percent of the annual total water consumption.[12] Clearly, technologies like smart metering, low-flow valves, and water recycling will lower consumption and demonstrate Israel's cutting-edge innovation to global markets.

FIGURE 2

Electricity use in Israel



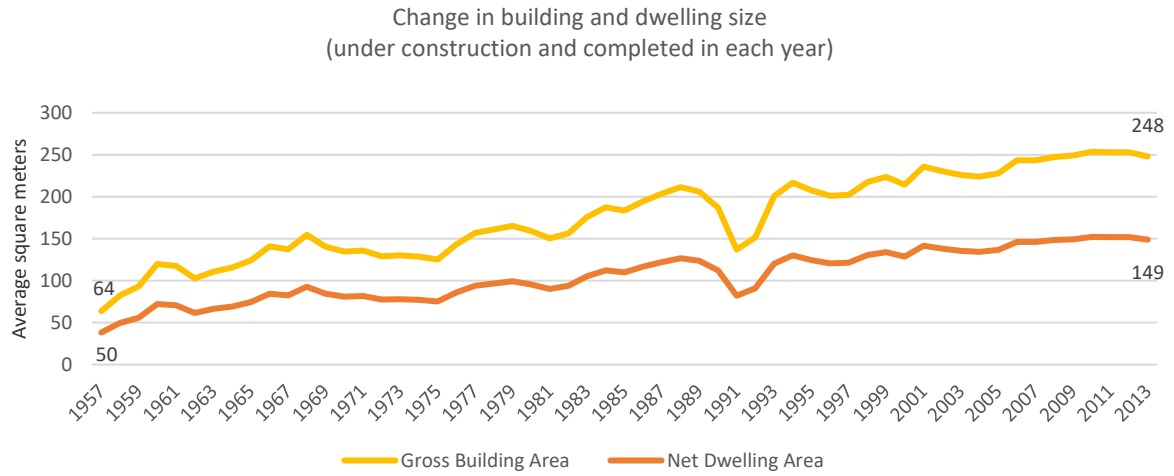
Source: Milken Innovation Center

As shown in figure 1, buildings consume nearly 60 percent of the electricity in Israel, and residential dwellings consume a third of that total.[13] As shown in figure 2, they also produce an estimated 28 percent of our carbon emissions.[14] Other residential fuel sources include gas, kerosene, and diesel fuel. Smart metering, efficient mechanical systems, insulation, and building techniques and design could all help reduce electricity consumption. Alternative power sources, such as solar PV (photovoltaic cells), could supplement these technologies.

On the planning and design front, demand is putting pressure on residential development, especially for affordable housing. In 2014, only the top 30 percent of the population could afford the costs of an average home.[15] With natural population increases, the demand for larger homes has risen as well, and dwellings under construction or completed in 2013 measured on average 149 square meters, or a full 25 percent larger than those built in 1990, as shown in figure 3.[16] In addition, with the rise of inefficient, low-density urban residential construction, and market demands for more and more affordable housing, we're seeing development push the boundaries of cities and encroach on environmentally sensitive ecosystems, protected lands and agricultural areas. Many neighborhoods, especially the poorest, lack easy access to urban public transit, thus forcing reliance on private vehicles. This push to remote urban areas increases travel time to work,[17] increases maintenance and transportation costs, requires the expansion of expensive infrastructure, and reduces overall affordability.[18] The increase in commute time/distance, congestion, and home operating costs also reduces disposable income while increasing financial risks of default in the mortgage market.[19] A growing number of econometric studies indicate that sustainable buildings outperform conventional properties in terms of risk, cash flows, and values.[20]

FIGURE 3

Change in building and dwelling size (square meters)

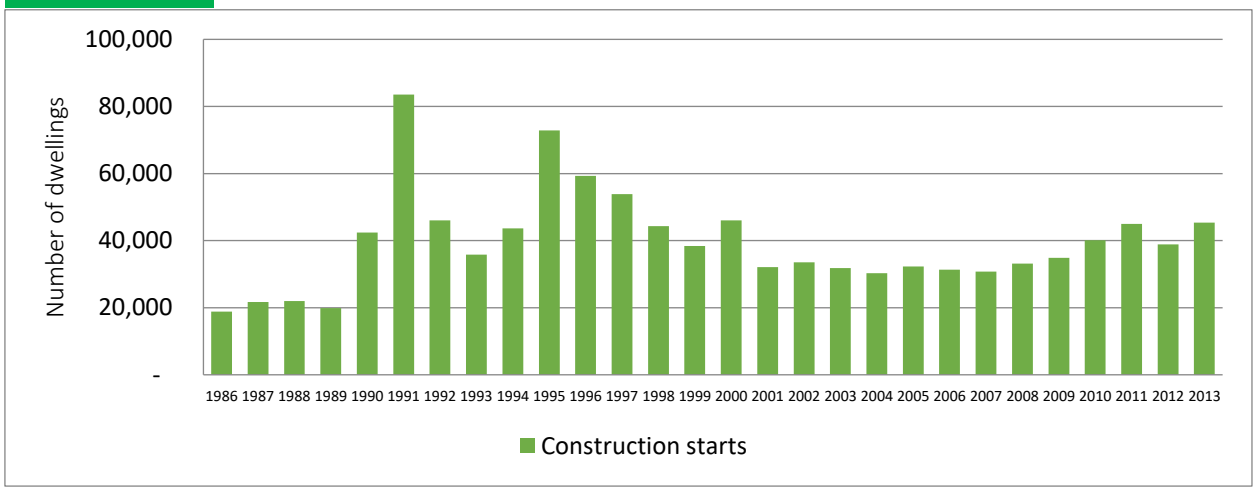


Sources: Israel Central Bureau of Statistics, Milken Innovation Center

The residential building sector is driven by a combination of population demand, available land and permits to build, and financial returns. Despite continuous population growth over the past decade, the number of building starts on available land have not kept pace, as shown in figure 4. As a result, new-home and home resale prices have risen dramatically, at the expense of greater economic efficiency.

FIGURE 4

Dwelling building starts

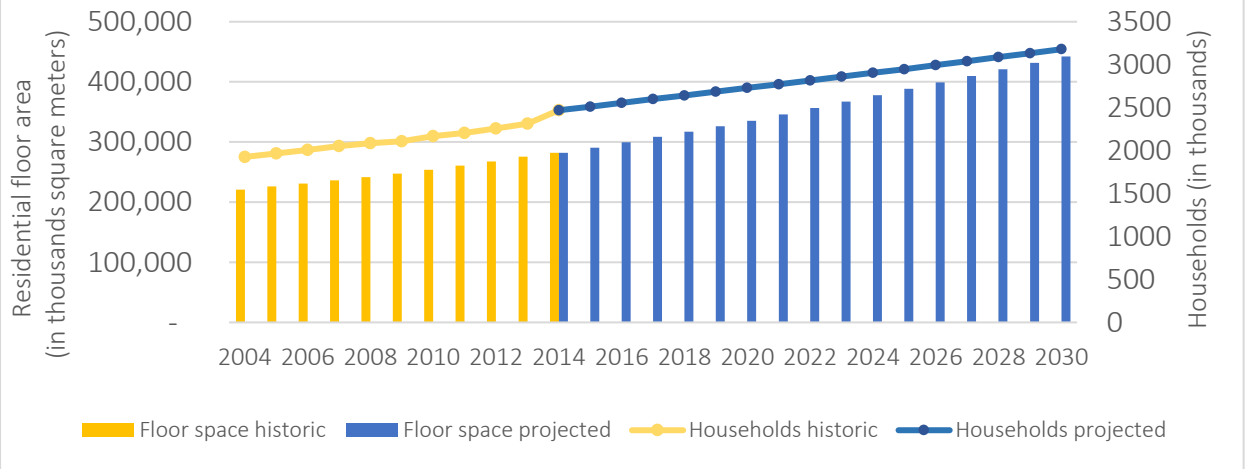


Source: National Economic Council, Ministry of Construction and Housing

Based on a marginal abatement cost curve (MACC) that considers scenarios for expanded energy-intensive uses,[21] as well as expected population growth and the related growth in residential building development (as shown in figure 5), the impact of Israel's residential sector on greenhouse gas emissions will grow substantially over the next fifteen years without the implementation of any mitigation measures. Based on this business-as-usual (BAU) scenario, electricity demand from residential buildings is expected to increase

by 60% by 2030 (rising from 16.3 TWh to 26 TWh in 2030). At the same time, GHG emissions from residential buildings is estimated to increase by 33% in 2030 (rising from 329 KtC02 in 2014 to 946 ktC02e in 2030). With the proposed mitigation measures outlined in the Ministry of Environmental Protection's plan, direct emissions can be reduced by 4.8% in residential buildings by 2030.[22]

FIGURE 5 Projections for housing and residential floor area



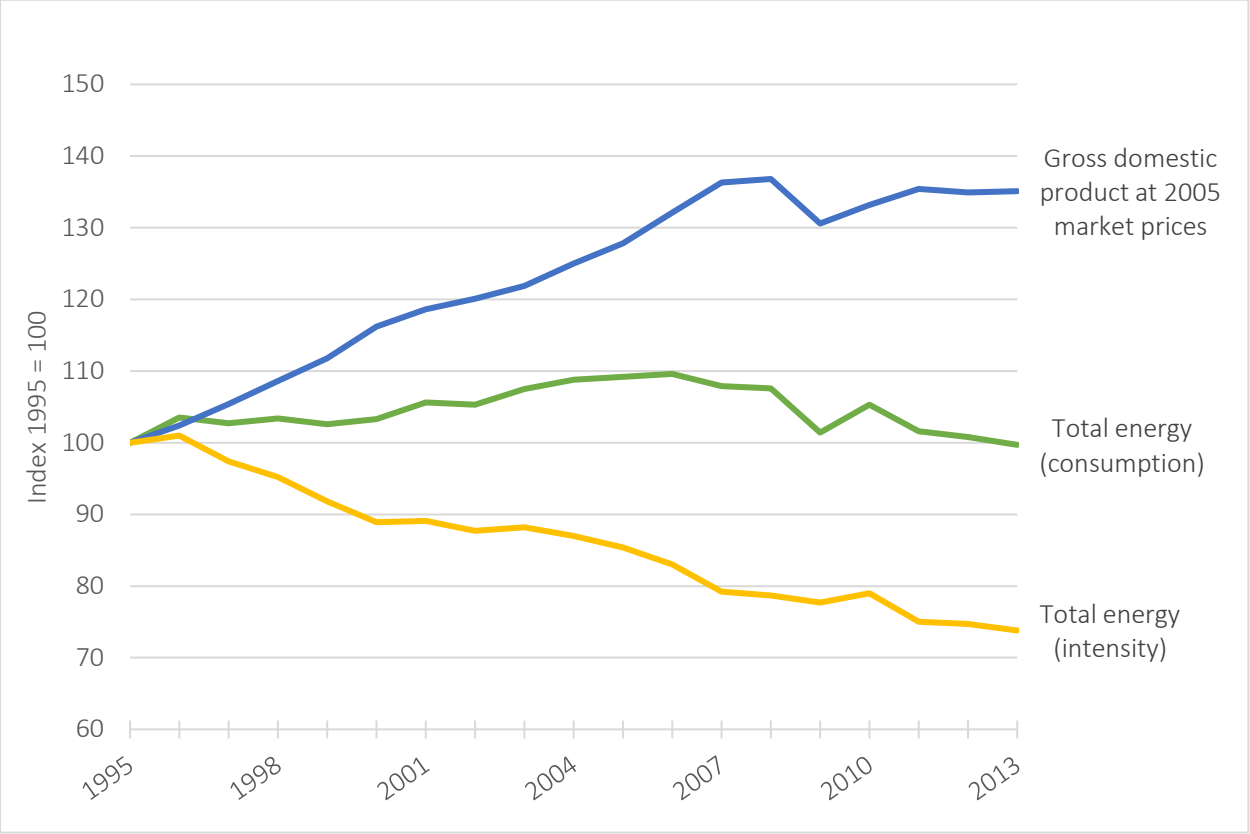
Source: MACC tool

Decoupling

Economists have generally assumed a trade-off exists between environmental sustainability and growth, but studies are showing that economic growth correlates well with environmental quality. The World Resources Institute and the International Energy Agency offer a growing body of evidence demonstrating that economic growth is increasingly unrelated to greenhouse gas emissions. In more than twenty countries surveyed from 2000 through 2014, GDP growth has taken place alongside a reduction in greenhouse gas emissions, as figure 6 illustrates.[23] With the right incentives and policies in place, nations can fulfill their growth plans and improve the quality of the environment on the planet.

FIGURE 6

Trends in GDP, energy consumption, and intensity[24] in the European Economic Area (EEA), 1990–2013



Source: European Environmental Agency

While these reductions have largely been a result of the growth in renewable energy sources (accounting for 90 percent of the total greenhouse gas emissions reductions), the trend has been strengthened by the 2015 UN Climate Change Conference in Paris agreement, COP21,[25] which contains an array of environmental initiatives, including green construction initiatives and proposed shifts to renewable energy. Israel is party to the agreement and has confirmed its pledge to reduce its carbon emissions to 7.7 tons per capital by 2030, a reduction of about 25% from a decade ago. More importantly, by deploying new technological and policy innovation to reach this goal, the country can expand its knowledge based capital export strategy to enable other countries to more aggressively address climate change abroad as well.

Standards, sectors, and participants

The definition of what is included in green building standards varies from country to country. The Israel Green Building Council has codified green construction to include technologies that address energy, water, site development, waste treatment, and operations and maintenance of properties, and the Ministry of Environmental Protection has passed a number of voluntary green building standards.

The cost premium of adding green systems to residential construction is estimated at between 1 percent and 5 percent of total costs. Economist Hagai Kot, a Tel Aviv-Yafo Academic College faculty and Lab

participant, reported that green premium costs in Israel are between 2.1 percent and 4.1 percent,[26] and are expected to decline as technological innovation enters the market more. Other estimates by Lab participant and researcher Ziv Lazar put the estimated cost of compliance with the green building standards (IS-5281) at 5 percent of total cost. As Israel's Green Building Council reports, the premium costs and technology adoption costs are both dropping as local markets strengthen.[27] In fact, some green systems—such as recycled paving materials, multiple glazing on windows, window and door seals, and window shading—are now included as standard construction practice. Innovation in green building also represents a considerable source of knowledge-based exports, a boon to the larger economy.

Lab participants discussed the highlights and parameters of three policy initiatives:

- IS-5281 passed in 2005: a voluntary program covering energy savings in new commercial and residential construction.
- IS-5281 revised in 2011: expanded to include new construction and extensive renovations for both commercial and residential buildings.
- IS-1738, proposed: calls for the use of sustainable products as a metric in determining the level of a project's environmental sustainability.

These initiatives support the objective of reducing energy consumption by 25–30 percent in new buildings. This can be accomplished in a variety of ways; the major components of green building solutions include the following activities:

- Smart metering: devices connected to the electrical systems of the home or building that report and manage household electrical usage; this may include simple feedback to help the customer modify energy use.
- Water softeners (lime scale): remove or minimize the calcium carbonate buildup that clogs valves and pipes.
- Lighting: includes fixtures and light sources, such as low-wattage bulbs.
- Solar shading: includes exterior fixtures to deflect light and heat.[28]
- Ground-source heat pumps: geothermal heat pumps that use the earth as a heat source in the winter and a heat sink in the summer; installed in the ground, with distribution pipes through the building; can heat and cool the air and water.
- Air conditioning: includes system and installation.
- Glazing: includes windows and skylights—glass, insulation, and installation.
- Insulation: includes the type of materials used within the walls and roof to prevent heat transference.
- Heating: type of heating system, including fuel, production, and distribution through the building.
- Appliances: refrigerators, dryers, washers, dishwashers, ovens.[29]

In the field of green building, there's a growing distinction between "consumption reduction" and "reduced emissions consumption." The latter, which is not included in the Israeli green standard, allows for the use of alternative, clean energy sources, such as wind and solar energy, to replace conventional power sources. Nevertheless, Lab participants discussed the use of clean energy sources, such as solar PV and thermal, geothermal, and even wind power, as relevant to the discussion. This report includes only those clean sources of power that are practical and can be implemented on a residential scale.

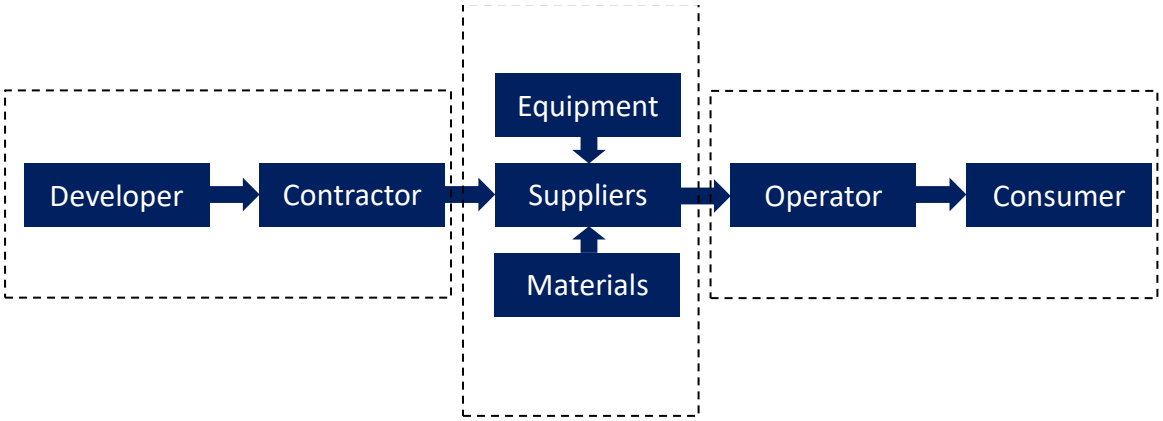
Building and Development Process

In general, as shown in figure 7, the project development process involves numerous actors who drive the development process, making decisions along the way according to market, regulatory and technology demands. For example, the developer generates the project, assembles the team, identifies the property, arranges financing, and builds the connections to the market. The developer must deliver a project that balances investors' demand for returns with the market for buyers.

The contractor must interpret the developer's plans into a practical, economical, and functional project. The contractor brings the skills and network together to source materials, labor, and capital, and delivers the project.

The contractor must also find suppliers, and the suppliers, both of equipment (lighting, mechanical systems, plumbing, etc.) and materials (e.g., roofing, block, concrete, windows, wood, etc.), must be able to find price-competitive domestic sources. Both equipment and materials must be of good quality yet economical, and they must "work" for the operator and tenants.

FIGURE 7 Green building development value chain



Source: Milken Innovation Center

The operator may be the tenant in the case of a for-sale home or apartment or, more rarely, a specialty management company. In either case, the operator must balance operating revenues (collected tenant payments) with the operating expenses (the fixed and variable costs of the project).

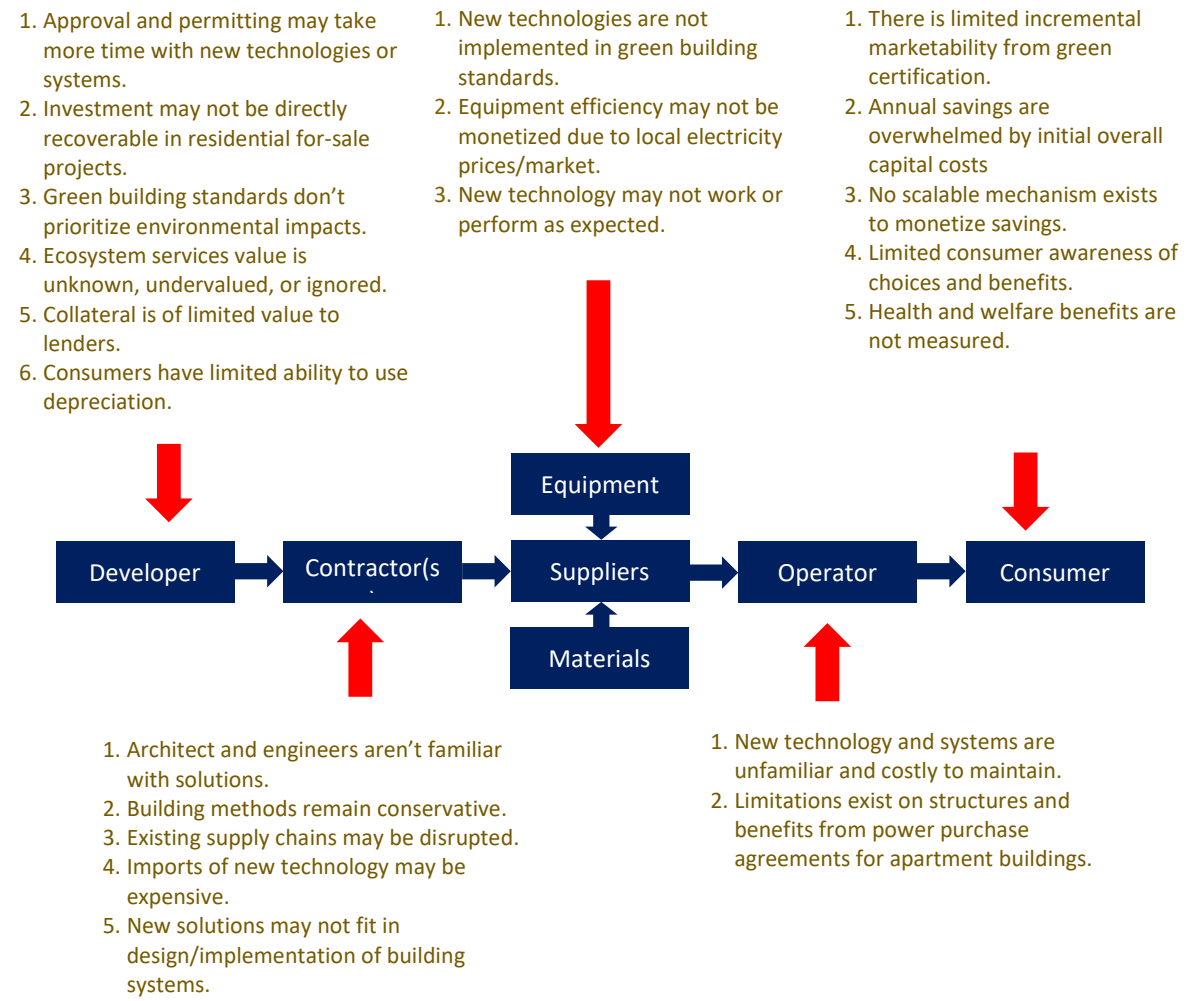
The consumer is the ultimate user of the project, either as a tenant in a rental apartment or the homeowner. Finally, and perhaps most important to the value chain, the consumer must be willing to pay the green premium and have sustainable access to financing.

BARRIERS

The entire residential building process provides a good framework for discussion of barriers to the use of green building technologies and techniques. Lab participants discussed the various challenges each actor in the process faces, breaking them down into regulatory, technology, financial, and market categories, as illustrated in figure 8.

FIGURE 8

Green building development value chain obstacles



Source: Milken Innovation Center

For developers, significant issues include excessively long waits for approval and permitting. According to the Israel Builders Association, it can take twelve years from the planning, design, and permit approvals to the construction and delivery of a new residential project![30] Adding new technologies and systems complicates the review and delays approvals further.

Another key issue is the disconnect between the savings generated over time from green building systems and market's unwillingness to pay for the systems that produce these savings. Financial policies currently split the incentives between developers' initial costs and the end-users rather than bundling them over the life-cycle costs of the building. Designing efficient financing mechanisms—either through internal financing (whereby owners or developers allocate funds from internal capital or operating budgets) or through debt financing, lease purchase agreements (that reduce upfront capital costs), or energy savings performance contracts (shared savings contracts)—would lower these cost barriers.

For their part, contractors must be more willing to work with new techniques and technologies. At the same time, however, they're reliant on architects and engineers to tell them how to integrate new approaches into plans. And they must be able to find local suppliers for these solutions—or else import supplies from abroad, which defeats the purpose of helping local entrepreneurs. At the very least, new solutions can disrupt industries and force them to acquire new skills and tools; and engender greater competition in the longer term.

Israel's cutting-edge technology startups face entrance barriers as potential suppliers because their costs must be competitive in a very price-sensitive residential construction industry. From the start, they must compete with the current market, not some monetized future savings based on widespread demand. This is a very difficult financial gap since the supplier cannot recapture this future value. Finally, there is always a risk of performance failure based on weather conditions (e.g., sun, heat, rainfall, etc.), installation (by untrained workers), or operation (e.g., by residents who don't know how to maintain the system).

Operators must ensure that the green solutions deliver lower operating costs. Israel is beginning to design and implement residential projects of long-term rental apartments, and the operators of these new projects must be able to deliver the new green solutions, realize sufficient net operating income, and pass along compelling savings to the residents. One opportunity lies in the production and sale of surplus power to the power company through a power purchase agreement. To date, the Israel Electric Company can accommodate these types of agreements, but they are not common or easily implemented.[31]

Finally, consumers face a variety of challenges. While Israel has implemented a green building standard for residential construction,[32] and the payback to consumers is estimated at 7-10 years depending on the level of investment in green technologies, there is still little quantified data to confirm the economic value realized from this certification, such as higher resale values. While there is a sense that consumers will opt for green solutions, that urge may be overcome by the sticker shock on home purchases and rents.[33] Since there is no structured way for the resident to realize the capitalized value of the energy savings (upfront) from lower operating costs (resulting from green solutions), residents cannot now easily compare the financial costs and benefits. While they may realize lower operating costs and higher resale value in future years, they cannot see those values when they have to make the decision to invest.

Lab participants stressed that these barriers are not unique to Israel, and have been overcome elsewhere. However, they agreed that we have unique challenges, including centralized planning and regulation, the small retail construction market, and the limited rental housing market. Still, they emphasize that Israel's culture of innovation can translate into opportunities for practical experimentation and smart initiatives.

BEST PRACTICES

The Lab featured a variety of best practice models, organized into three broad areas: capital access and cost; capital structure; and regulation and education.

The discussion about policies, programs, and projects was illustrated with examples from Bob Blumenfield, Los Angeles City Councilmember and former California State Assembly member; Tabitha Scott, senior vice president of innovation and sustainability for Balfour Beatty Investments, which builds residential communities across the United States; and Susann Bollmann, manager of the Germany's Financial Forum for Energy Efficiency in Buildings (Effin).

Capital Access and Cost

Lab participants discussed the use of multiple best practice models to capture capital access and cost. Table 1 summarizes the relevant models designed and presented by Milken Fellow Omri Carmon.[34] In addition to the key features of each, Table 1 offers a list of lessons learned following the discussion held during the Lab.

TABLE 1 Best practice program models, key features, and lessons

Model	Key Features	Lessons learned
Revolving loan funds	• Subordinated, long-term loans for green and related improvements • Loans repayments used to pay back original capital and make new loans • Capitalized with reserve fund to cover loan loss risks • Government to issue tender for RLF owners and operators • May operate in partnership with banks or institutional funders	• Lower-cost capital improves profitability of projects • Credit analysis can include savings from green improvements, allowing a higher loan-to-value ratio and a better debt-coverage ratio • Flexible structure and terms to meet market needs • Decentralized control and operation
Guarantees	• Contractual commitment to shift risk from the lender and investors to the guarantor • Fee for the outstanding principal coverage for the guarantee • May be used to cover bank or capital market investment in bond pools for green projects	• May be leveraged, allowing a first loss or partial coverage • Fees and recovery allow the guarantee to become sustainable • Effective to leverage new capital market investors into projects
Technology efficacy insurance	• Provide insurance to developers and residents that technologies will work • Broad participation and fees will allow for sufficient financial capacity to provide cover losses	• Program may be sold into capital market (reinsurance) to ensure liquidity • Scale must be achieved to mitigate risk

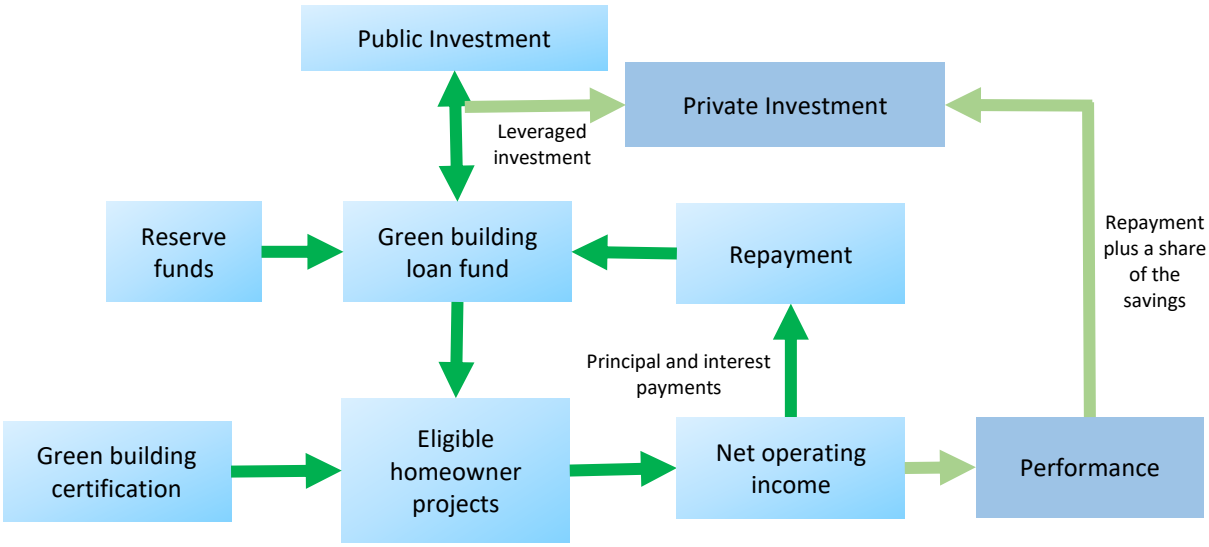
Tax credits	• Tradeable credits based on eligible green improvements • Ability to raise equity investments and lower threshold for returns from project cash flows	• Performance measurement over period to ensure compliance

Source: Milken Innovation Center

A GREEN REVOLVING LOAN FUND

A revolving loan fund for green building would be structured to deploy a combination of public and private investment that provides competitive terms (such as lower rates and long maturities) for loans pertaining to the green building portion of an eligible project.

FIGURE 9 Illustration of revolving loan fund model



Source: Milken Innovation Center

In addition to the flexibility that a revolving loan fund can offer—including subordinate financing that could lessen the collateral and security restrictions on borrowers; lower periodic interest costs and fees; and longer maturities for the repayment period than are available at conventional banks—it can also make use of a performance-financing innovation that allows for a boost on the repayment, based on savings performance. This feature is particularly relevant with energy and cost savings as twin goals. With this performance feature, private investment can be leveraged at an even higher rate in return for taking on a share of the performance risk.

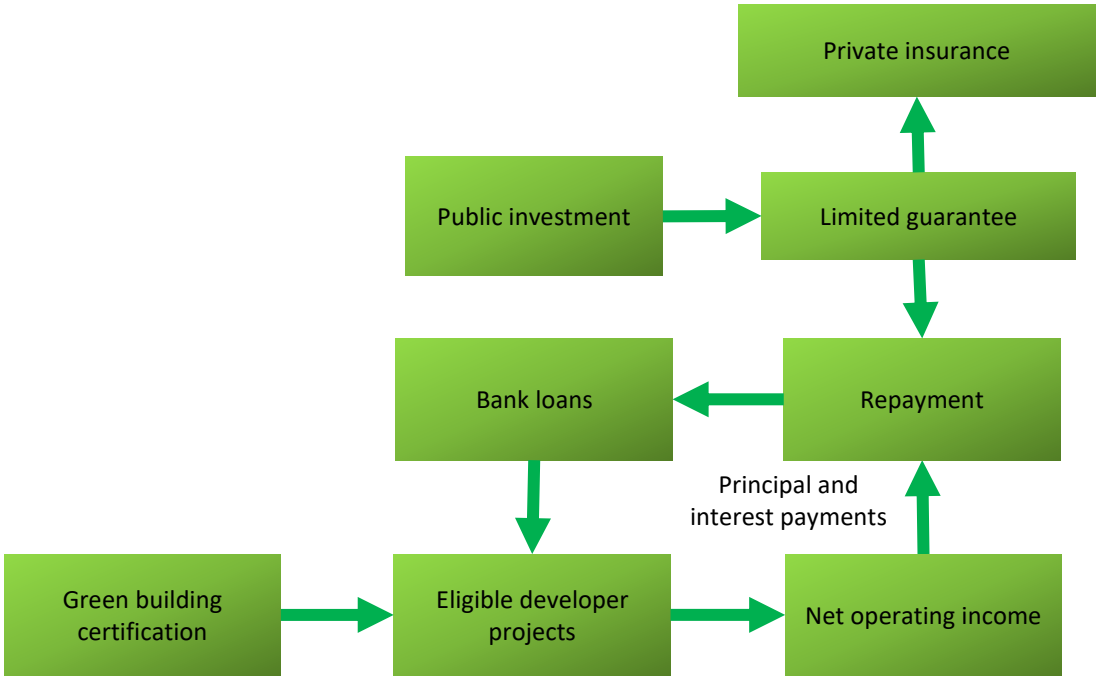
GREEN GUARANTEES

The use of public guarantees, even limited guarantees, can leverage private insurers to mitigate the development, market, financial, and technology risks. A combination of public and private guarantees can

leverage better terms on bank loans, including higher loan-to-value ratios (the amount of a loan as a percent of the total cost of a project), and lessen the burden on collateral pledges, since bank credit underwriters may not be familiar with green building systems.

FIGURE 10

Illustration of green guarantees



Source: Milken Innovation Center

The use of blended public and private guarantees to shift the risk from the lender and the project owner could also help reduce the risk associated with the adoption of new technologies, having the effect of technology efficacy insurance.

Technology efficacy insurance

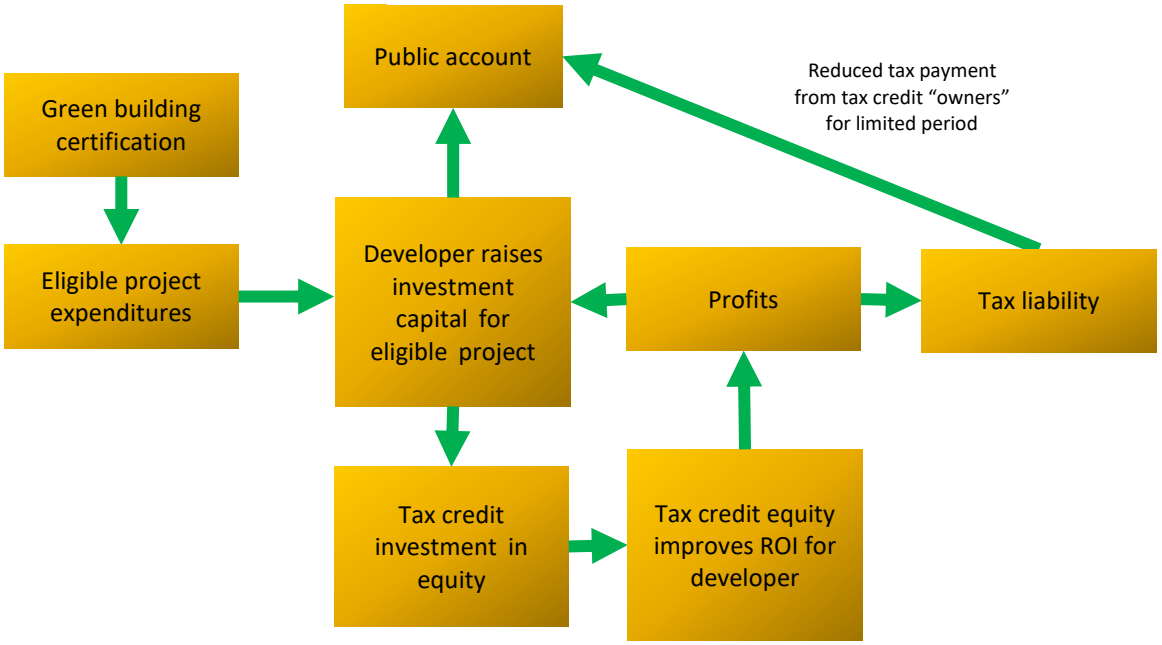
Efficacy insurance covers the adoption of technologies that may be new to the market, and may cover a range of performance issues, including development, regulation, production, and delivery. Developers, contractors, and operators are risk-averse, so having an insurance coverage or a guarantee is important. Warranty insurance, for example, already covers certain performance-related risks and can be expanded to early commercial technologies. Precedents from satellite launches or joint public-private approaches used in terrorism risk or nuclear energy could translate to applications in water technologies.[35] Large financial products companies, such as Euler Hermes in Germany, use technology efficacy insurance to promote solutions in targeted sectors, such as energy-saving technologies.

TAX CREDITS

Tax credits are already an important tool in many developed green building markets. Particularly when tradeable to third-party investors, tax credits allow projects to become more attractive for equity investors by boosting the returns on equity.

FIGURE 11

Illustration of green tax credits



Source: Milken Innovation Center

Tax credits are important and yet unused policy tool for investor-based projects, such as long-term multifamily rental residential units, which are poised to become a larger part of the domestic housing market. The certification and monitoring of green building systems is an important part of the tax credit system, giving the tax credit to investors for a designated period based on successful implementation of green systems. This aligns the interests of regulators, developers, owners, and residents.

Capital Structure

Examples of capital structure models demonstrate innovative ways of putting together basic tools, such as loans, in a way that offers incentives to all the actors, aligns their interests, and leverages new investments. The following table lists notable characteristics of these models and lessons learned from the Lab discussion.

TABLE 2 Best-practice program models, key features and lessons

Model	Key Features	Lessons learned
Green bonds	• Growing asset class • Targeted market for environmental investors • Long-term debt with customized features • Effective leverage from government funding and guarantees	• Scalable source of new capital • Customized terms to meet investors and projects
Environmental impact financing	• Sets target energy saving goals and raises financing based on meeting those goals • Incentivize investors based on performance	• Shifts risk from developer and homeowner to private investors • Aligns interests of investors, developers, and residents to ensure performance

Source: Milken Innovation Center

GREEN (PACE) BONDS

Los Angeles City Councilmember Bob Blumenfield chairs the council's Energy and Environment Committee, and discussed his experience with California's property assessed clean energy bonds for residential homeowners, known as PACE bonds.[36] The first residential PACE bonds were introduced in 2008. A PACE bond involves the voluntary assessment of a residential property that stays with the property, even if sold. It provides 100 percent financing of green building improvements, which are repaid as an addition of the assessments to the owner's property tax bill. As such, it carries a priority lien that supports a revenue bond to provide capital for solar retrofits. (Connecticut and Delaware have introduced both tax bill and other payment systems to boost penetration and adoption in those markets.)

The economic and environmental impacts in California demonstrate the effectiveness of the PACE program:

- $1.4 billion in economic impact
- 7,000-plus jobs created
- 1.3 billion gallons of water saved
- 5,600 gigawatt hours saved (1 gigawatt = 1 million kilowatt hours)
- $1.6 billion in utility savings
- 1.7 million tons of emissions reduction

Source: CAEATFA

Since 2011, with the passage of state the Improvement Act (see below), over $830 million in funding has been provided for more than 41,000 properties in 330 California cities and counties. PACE has been extended to commercial and municipal buildings, as well. As of January 26, 2016, "PACE legislation has been authorized in 33 states and Washington, D.C. and 16 states and Washington, D.C. have active PACE programs," according to the National Conference of State Legislatures."[37]

Because the first lien provision met initially with resistance from public and private mortgage lenders, California voted in 2013 to allow for credit enhancement through the California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA) Loan Loss Reserve Program.[38]

The California PACE program operates under two enabling laws. The first is the state Improvement Act (AB 811), which allows for the formation of the assessment districts for bond issuance. The second is the Mello-Roos Act (SB 555), which authorizes the formation of community facilities districts. With these two laws in place, a participating municipality creates a special tax district that consists of all properties within the municipal boundary. The municipality then opts in to a Joint Powers Authority, which authorizes the collection and allocation of the assessments and allows for the property owners to participate in the program.

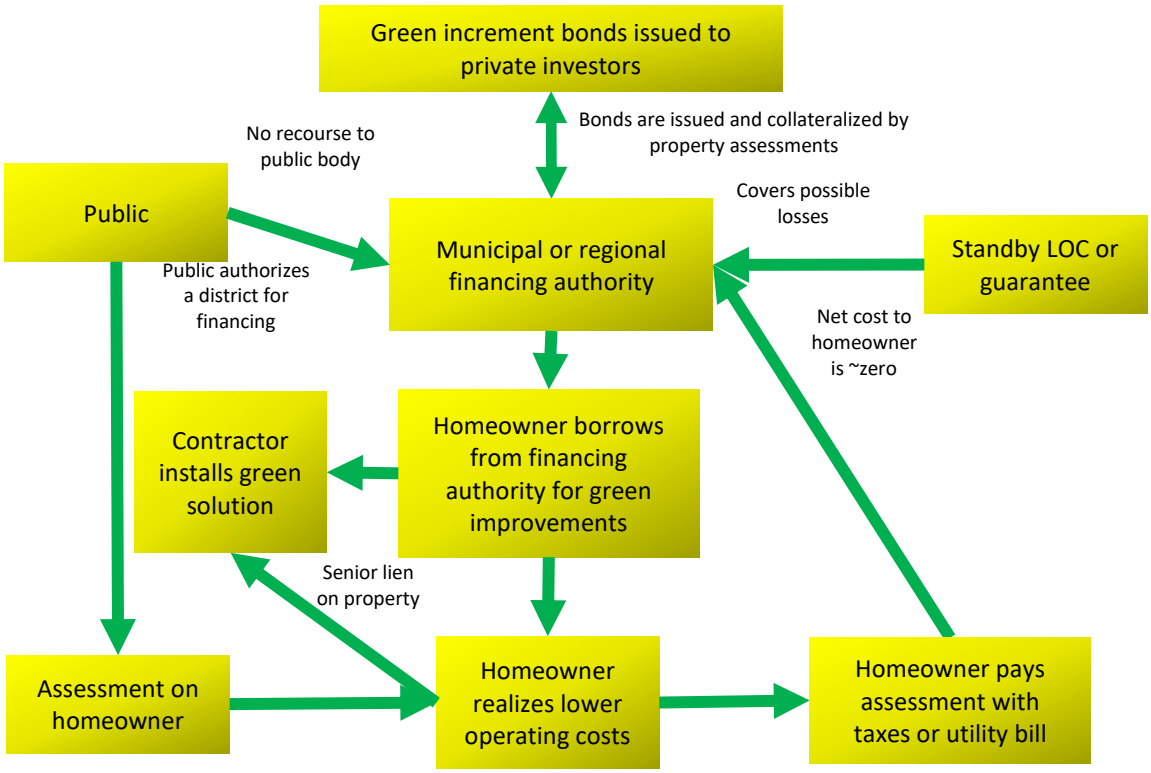
Beyond PACE bonds, the California state treasurer has also expanded the certification, pre- and post-issuance requirements of green bonds in other areas that affect green building, including funding that measures, monitors, and incentivizes rewards for air pollution reduction, clean water, protection of rivers, and conservation finance.

PACE is just one of many other green programs, such as the enormously successful US Environmental Protection Agency's ENERGY STAR program for certified green products, homes, and buildings, that have been put in place to advance US goals to cut greenhouse emissions up to 28 percent by 2025 and double energy productivity by 2030.[39]

In the United States, there are more than 130 million homes whose combined energy demand accounts for over 20 percent of the nation's greenhouse emissions and 23 percent of its total primary energy consumption.[40] Israel has barriers related to high upfront costs (no supporting government loan subsidies, loan guarantees, green energy "challenges" for firms, or other state incentives in place) and of course a lack of any comparable scale, but these differences present opportunities for solutions that Lab participants explored. Figure 13, in fact, illustrates how an Israeli green bond could work.

The policy outcomes of these measures are clear: the solar industry added jobs ten times faster than the rest of the economy as the average cost of solar electric systems dropped by 50 percent.[41] Distributed solar prices fell 10–20 percent, and 44 states adopted pricing structures to increase increased penetration of distributed energy systems.[42]

FIGURE 12 Illustration of green bonds (PACE bonds)



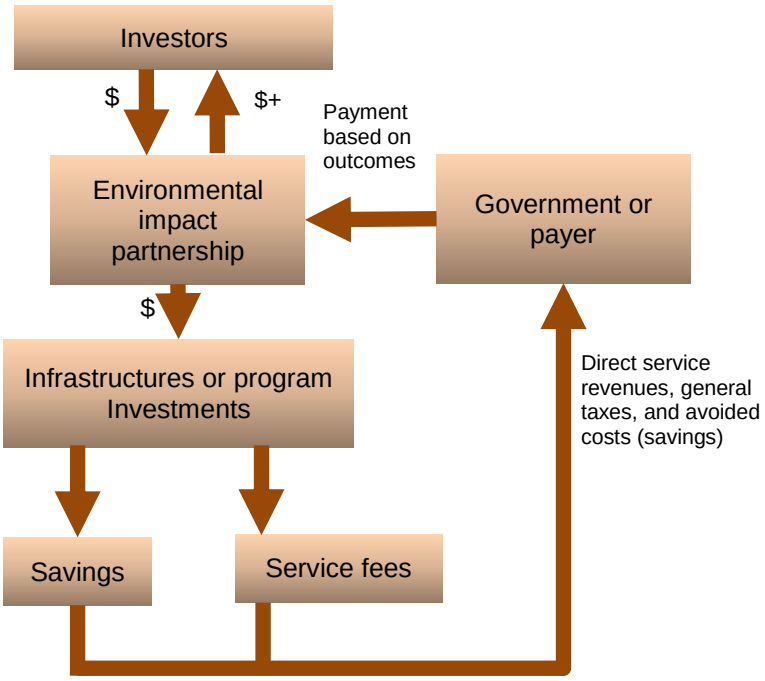
Source: Milken Innovation Center

ENVIRONMENTAL IMPACT FINANCING (EIF)

Impact financing works by using "avoided costs" to attract private capital. Avoided costs are the financial savings that result from the success of the project. This impact financing model has been applied to several health and social service areas, including youth at risk, diabetes prevention, and school retention programs

in the United States, the UK, and Israel. The model can be applied to environmental and water sectors, as well, where reduced water usage would result in savings. The realized savings then go to support the repayment of the obligation. Again, by shifting the risk from government to private investors, and compensating these investors for assuming the risk, the government gains a successful project and the investors see a risk-adjusted return on their funds. Figure 14 shows how an environmental impact bond could be structured.

FIGURE 13 Structure of environmental impact financing



Source: Milken Innovation Center

In an environmental impact bond (EIB), institutional pension funds, insurance funds, philanthropies, and other traditional investors invest funds in proven environmental "impact projects" that reduce or avoid costs for farmers or to municipal water authorities. The realized savings, again, would support the repayment on the investment. The amount of "savings," still to be paid by the users of the infrastructure for a specified period, would be allocated between the parties in the project, including the users and investors, thereby reducing the overall cost to the payer and financing (at least a portion of) the project.

Using the logic of financing based on avoided costs (spending less on energy costs), the non-profit NYC Energy Efficiency Corporation provides insurance or credit enhancements to encourage mortgage lenders to introduce energy efficiency, clean fuel, and water efficiency into the metrics used in financing projects. The New York program, provided by select mortgage underwriters, allows a higher loan-to-value ratio by using the discounted portion of the projected energy savings into the debt service coverage analysis. In short, the borrower has access to funds to be used for approved energy-efficiency investments.[43]

An energy services company, or ESCO, is another financing option. Found mostly in the energy sector, ESCOs are performance-based contracting companies that perform multiple services, including helping clients engineer energy-efficient solutions and reap the benefits of improved performance through a special purpose company.[44] The ESCO is paid along performance milestones and savings thresholds. The returns to the ESC0, and the dividends paid to investors, compensate them for shouldering risk. Most ESC0s are in the municipal, school, university, and hospital markets, leveraging high demand and potential savings from a single payer. Only about 3 percent of ESC0s in the US are in the residential sector, largely because of the difficulty in measuring savings and collecting payments on a disaggregated basis.

Balfour Beatty Investments, one of the largest US property owners and operators, also owns an ESCO operating in the US residential sector. Lab participant Tabitha Scott described how Balfour Beatty is one of four companies, through its Communities' Military Family Housing portfolio, that have partnered with the Department of Defense to install solar on military housing on dozens US military bases.[45] The provision of the energy-saving technologies and systems are delivered as a service, allowing the Department of Defense to receive the systems and pay a fee for the services from the reduced energy costs.[46] The developer can install and own the systems, and take the depreciation. With the massive construction and uniform requirements, Balfour Beatty has grown its successful performance-based financing to scale.

Regulation and Education

Lab participants agreed that the regulatory oversight of residential construction must adapt to new technologies and building systems. At the same time, they recognized that the centralized energy production and distribution system must also address the rise of alternative, decentralized energy production systems. Recognition has occurred in the non-residential sector but it slow to gain a foothold in the housing arena.

At the same time, Israel must step up education and awareness efforts at all points of the value chain, as explained by Susann Bollmann of the Financial Forum for Energy Efficiency in Buildings (Effin), who discussed the importance of feedback in efforts in Germany. Success of smart metering and reporting, for example, depends on whether the information changes behavior. WattzOn, a smart-metering and feedback platform based in California and founded by Lab participant Martha Amram, is just one example of the growing services and products sector that supports green construction and green building operations.

NET METERING AND GRID REFORMS

Another method of financing the installation of solar energy system is through a power purchase agreement (PPA). These agreements allow for a developer to carry out all phases of the installation and operation of the solar energy system. The developer also bears all the costs but has a long-term agreement to sell the electricity from the system to the resident at a rate below the grid price. The lower price allows the resident to offset the market price from the grid, and the developer can profit from the sales and other incentives, such as tax credits and depreciation.[47]

Mini-grids and public housing

One example of an innovative project structure combined with capital structure was developed by Lab participant Nir Lotan, a Fellow with the Ministry of Environmental Protection. Because of the low-rise (generally four-story) and long footprint of the existing buildings (common in public housing built during the 1970s and 1980s), there was sufficient roof area to install solar PV.

Lotan's capital structure includes a limited guarantee on a loan to carry out a series of renovations on a housing project, including the installation of solar PV, insulation, triple-glazed windows, and energy-efficient heat and ventilation systems.

The energy cost savings were sufficient to repay the loan and carry out long-term annual maintenance on

There are many benefits of this approach. The resident has no upfront capital costs, enjoys reduced and predictable energy costs and a higher market value of the property,[48] and faces limited financial or technology risk. The developer, meanwhile, benefits from incentives and tax credits.

A local adaptation of this project structure under consideration is the use of the large roof surface area to create an urban mini-grid—combining a variety of smaller and taller structures that by themselves have insufficient roof areas—to create enough alternative power for underserved neighborhoods. Table 3 provides an overview of the key features of urban mini-grids, and the relevant lessons learned over the course of the Lab This would require net metering and a power purchase agreement with the electric utility, as well as metering and monitoring of the production and use of electricity with the mini-grid. The savings from lowered energy costs could generate enough capital to cover the deferred maintenance. Mini-grids are being deployed in developing countries where national or regional power grids don't yet extend to smaller, rural communities. These mini-grids can power several homes, small businesses, and even water pumps to irrigate farm fields.[49]

TABLE 3

Best-practice program models, key features and lessons

Model	Key Features	Lessons learned
Urban mini-grids	• Create cost-effective, self-contained power generation networks. • Limited distance with network reduced infrastructure and carrying costs.	• Use of appropriate technology • Must gain participation of regulators and power producers • Match complementary users within network (large and small buildings, cycle times, etc.)

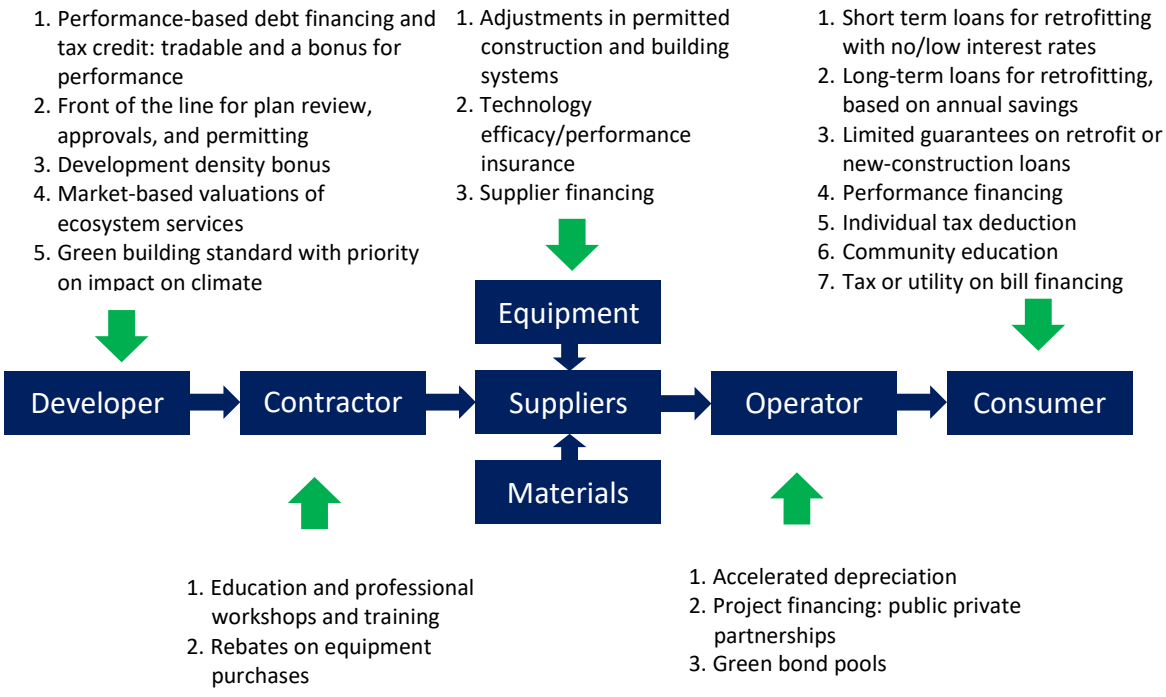
Source: Milken Innovation Center

POTENTIAL SOLUTIONS

Based on the discussion of best-practice models and programs elaborated upon above, Lab participants discussed a range of possible policy, financial, regulatory, and marketing solutions for the various points in the green development value chain.

For the developer, key solutions include performance-based debt financing and tax credits to attract equity to the project, improve cash flow, and lower the threshold for a competitive return on equity. By making the tax credit tradeable, the developer could attract passive investors who might (and often do) look elsewhere for profitable projects. Another important solution is an expeditious review and permitting process, even allowing for high-priority reviews for developers using certified green building methods. Finally, developers who build affordable housing should be eligible for a density bonus, which is itself a green objective. Figure 14 below lists potential solutions, categorized by impact on the various actors along the value chain.

FIGURE 14 *Value chain solutions*



Source: Milken Innovation Center

During the Lab, Susann Bollmann of effin described her firm's use of training and education for contractors. These programs are instrumental in making contractors comfortable with the latest green

technologies and construction solutions. In addition, she said, rebates on special equipment purchases would lower a contractor's capital expense.

Suppliers could benefit from a combination of financing with favorable terms—including performance-based payments, insurance, and performance guarantees on new technologies—and adjustments to new building codes to allow for the use of green technologies.

Operators would benefit from accelerated depreciation, especially for capital-intensive systems; project financing, including public-private partnerships, for long-term multi-family projects; and the creation of revenue bond pools supported by green residential and carbon emission reduction projects.

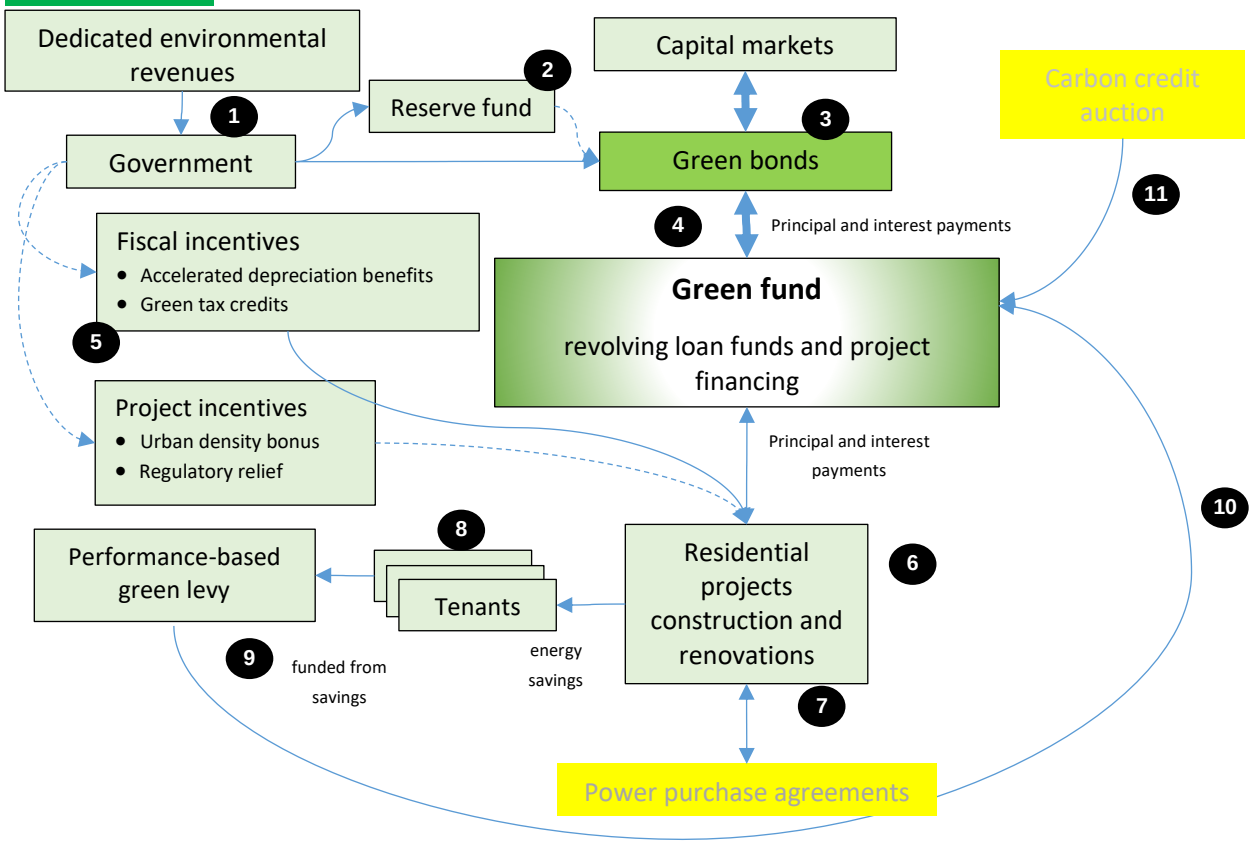
A revolving loan fund could provide loans for retrofits, for the benefit of consumers. The fund could be capitalized through the issuance of green bonds and supported by a reserve fund to ensure sufficient cash flows to pay back the bonds. The repayment of these loans could be on-bill or special assessment (real estate tax) financing. Investment in green building improvements could qualify owners for tax rebates or deductions. Finally, community education about the importance and methods of green building systems is essential.

Green Fund

Combining many of these solutions, a Green Fund is a green bond financing facility that addresses the best of all these areas: best practices in capital access and cost, capital structure, and regulation and education. It has an impact on all participants (e.g., consumer, operator, builder, developer, lender, and investors) along the value chain, and it the optimal recommendation that emerged from the Lab.

Figure 15 illustrates how the green bond could work, and how it would support the growth of green building in residential construction.

FIGURE 15 Proposed green bond financing structure



Source: Milken Innovation Center

The system starts with the government deciding to launch a Green Fund initiative (1) and allocating funds to a reserve fund (2) as assurance to the capital markets that funds are available to repay the green bonds that the government will issue, and to maintain a flow of annual funding dedicated for the country's environmental goals. The funds may come from existing appropriation or budget authorizations,[50] and/or revenues from energy tariffs and/or a share of energy savings. The fund will issue green bonds (3) in the capital markets to a combination of market and impact bond buyers (e.g., social investors, such as philanthropies).[51]

The proceeds of these bonds will support the creation of the Green Fund that will support revolving loan funds (RLFs) (4) and project financing. In addition to the creation of revolving loan funds and project financing, the government would introduce two incentive initiatives (5). The first would include fiscal incentives, such as accelerated depreciation and targeted tax credits. The second would include project incentives, such as development bonuses and regulatory relief. Both incentives would be tied to green building investment by the eligible developer.

A developer of multi-family projects and single family retrofits (or new construction) would apply to the revolving loan fund (6). Eligible projects could participate in a power purchase agreement that allows for new power metering, including credits and payments for power supplied to the grid (7). Both tenants and owners would realize energy costs savings (8). Based on a portion of these savings as a result of the green investment, tenants and residents would be subject to a green residential levy (9), perhaps as an incremental surcharge on utility bills and based on a share of the savings.[52] The proceeds of these levies would supplement repayments to the revolving loan funds (10). The public auction of carbon credits is another possible solution (11), with proceeds supporting Green Fund operations.[53]

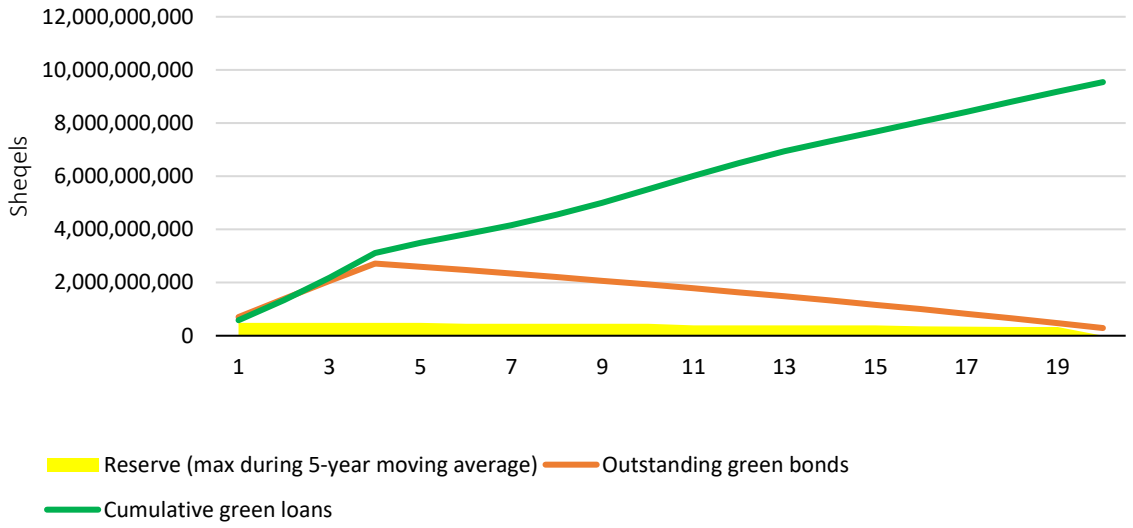
For a draft of Green Fund guidelines and more information on this proposal, see appendix V.

GREEN FUND PROGRAM SUSTAINABILITY

Based on a stream of projected revenues from a dedicated environmental fund for an initial period, and the use of repayments from green loans to residential developers, we prepared a financing scenario for the issuance of approximately NIS 3 billion in revenue bonds, using a NIS 500 million limited guarantee. The bond would be issued at a market rate (estimated at 3–6 percent interest), long-term payment (estimated at 20–30 years). The coverage ratio of the debt would be approximately three times the needed revenue to repay the bonds because of the supplemental dedicated environment funds and the repayments from developers during each year. The bond issues would include payment of the financing fees (2 percent) for the bond placement. The net bond proceeds would be used to capitalize the Green Fund.

FIGURE 16

Illustrative projection of Green Fund



Source: Milken Innovation Center

The Green Fund would make loans to projects or specialized revolving loan funds. The projects would realize savings on energy costs and, in turn, would pay a special tax levy based on the savings, which would be used to supplement the repayment of the bonds and increase capital for the Green Fund. It is expected that the Green Fund would maintain a level of loan activity initially from the original green bond, and would achieve sustainability and growth, reaching over NIS 11 billion in green loan activities over twenty years. Depending on the size of loans to each project, this will lead to investments in more than 85,000 green building projects over the period.

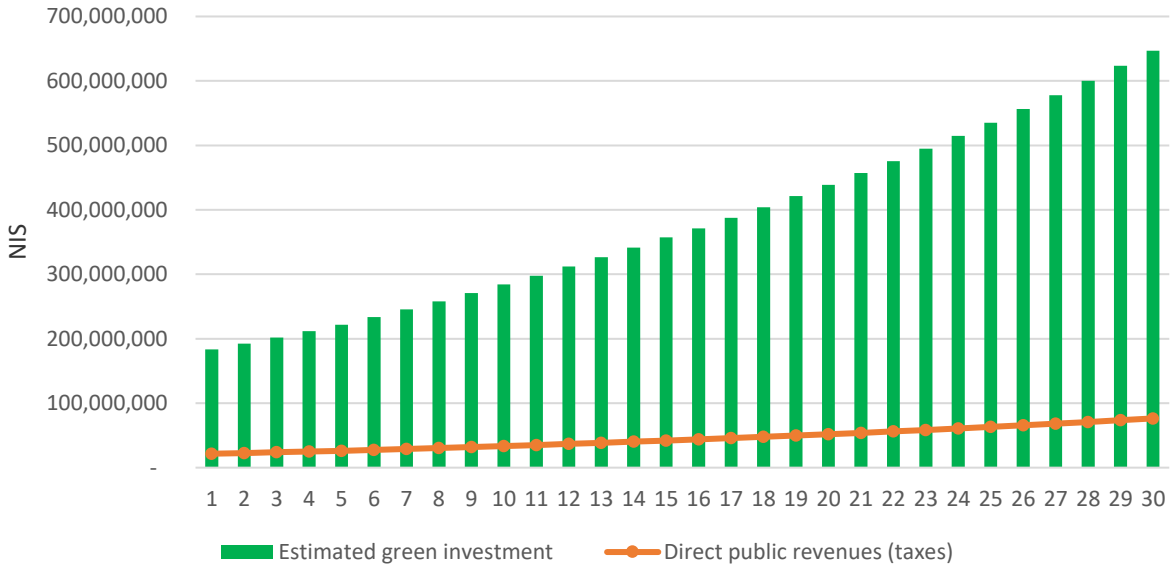
The amount of bond proceeds would depend on the amount pledged from the annual revenues from the various environmental funds. And the number of green building projects would depend on the amount of bond proceeds.[54]

GREEN FUND – PROJECTED PROGRAM IMPACTS

Given the project size of the fund in this scenario, and assuming a relatively small (10 percent) market penetration of the Green Fund in new and renovation projects, we estimate the resulting green investment and related direct tax revenues, the impact on energy consumption and savings, and the expected reductions in GHG emissions.

FIGURE 17

Projection of Green Fund direct estimated green investment and related tax revenues

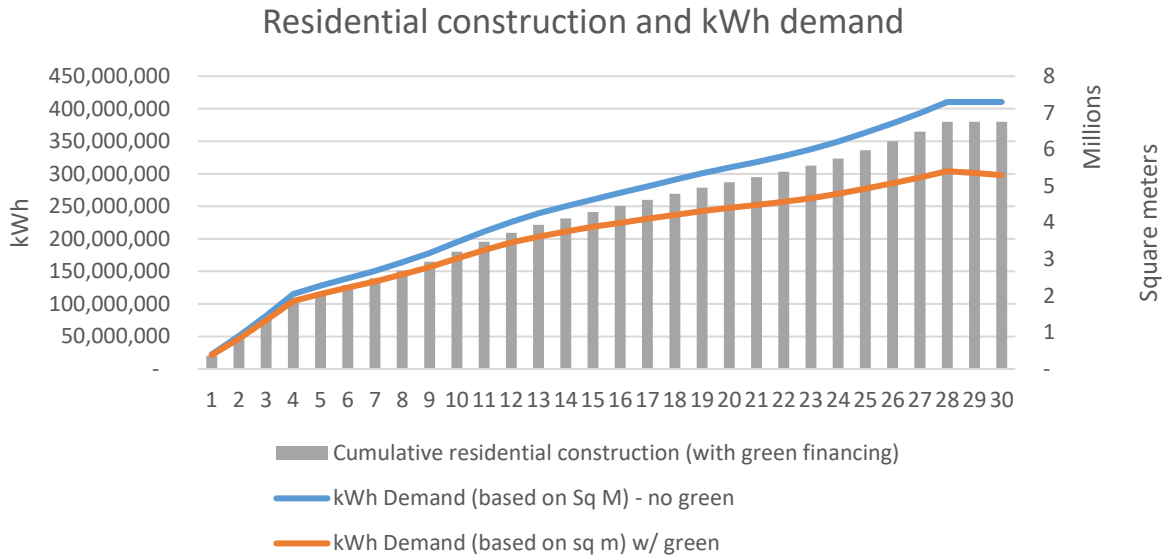


Source: MACC Tool, Milken Innovation Center estimates

Using these estimated expenditures, we estimate the number of workers needed to install these improvements and the additional income and direct tax revenues to the government.[55] We estimate that government revenues from these expenditures, in direct VAT on purchases of green improvements and income taxes for workers involved in the installation, will average an estimated NIS 45 million per year over the next thirty years.[56]

FIGURE 18

Projection of Green Fund residential development investment and energy demand

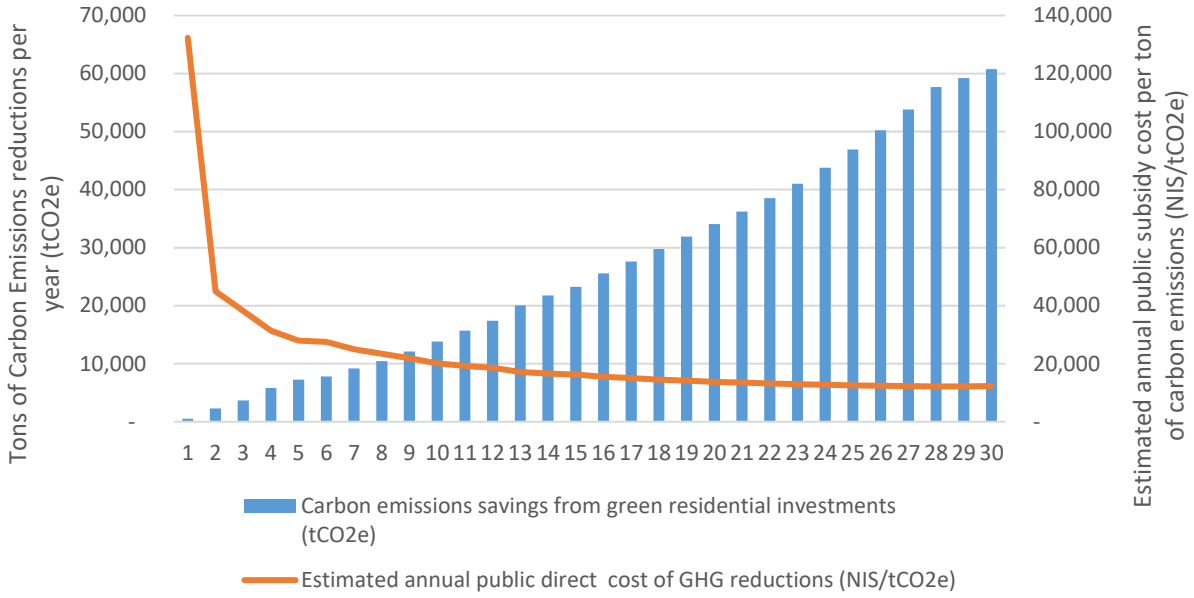


Source: MACC Tool, Milken Innovation Center projection

Based on data in the marginal abatement cost curve (MACC) analysis, the expected change in residential energy use would result in a reduction in energy use by 8 percent initially, rising to 16 percent annually over the next fifteen years.

FIGURE 19

Estimated carbon emissions reductions per year (tCO2e/year) and the estimated annual cost of those reductions (NIS/tCO2e/year)



Source: Milken Innovation Center estimate based on MACC Tool data

Finally, at this level of investment activity in an estimated 81,000 apartments cumulatively by 2030, we estimate that the annual greenhouse gas (GHG) reductions, as a result from the direct investment in this scenario, will comprise just over 20,000 tons of carbon emissions per year in 2030, or about 1.5 percent of the national goal of GHG reductions in the residential sector. Of importance, the marginal cost of the public subsidy needed (in the form of the support for the Green Fund described in this report) will drop to about NIS 20,000 per ton of carbon emission reduction per year.[57]

GREEN BUILDING IMPACTS

Based on the Israel Central Bureau of Statistics and the Ministry of Housing and Construction, the government projects construction of about 45,000-65,000 residential new-builds per year, either as standalone homes or apartments in multi-family buildings. From this estimate, we can project the incremental floor area, green building market capture, and the associated capital and share of green building investment.[58]

TABLE 5 Project scenarios, financial tools and results

	Construction	Installation	Financial tools	Estimated break-even and return
Single Apartment	New	Windows HVAC Smart meters	None	Year 17
		Windows HVAC Smart metering Solar PV[59]	Subordinated debt Green increment financing, based on savings Solar net metering	Year 5
Single Apartment	Renovation	Windows HVAC	None	Year 6
		Windows HVAC Solar PV	Net grid credit for PV solar	Year 4–5
Multi-family rental	New construction	Window glazing Insulation Smart metering Materials	None	Over 20 years 6 percent return on equity
		Windows Insulation Smart metering Materials Solar PV	Subordinated debt Guarantee Tax credit Accelerated depreciation Solar net metering	Year 3–4 20 percent return on equity

Source: Milken Innovation Center

We estimate that the green investment for residential construction will triple over the next fifteen years, coming to about NIS 1.8 billion per year.

The results of these model scenarios illustrate the sensitivity of each model to various financial tools. Without them, payments for either project type, single for-sale apartment (new construction or renovation) or multifamily rental apartments, would require long payback periods. See appendix IV for descriptions of the models.

ROADMAP FORWARD

Lab participants recommended the consideration of a combination of the following program initiatives – many of which can be integrated into the proposed Green Fund. Separately, each initiative may be inadequate. The financial context for these and other possible initiatives and programs are identified further in the appendix II.

- Tax benefits: to increase the return on equity for active and passive investors in the direct capital investments in green technologies.
- Lower-cost, longer-term loans: to lower the cost of debt with more flexible terms, shift risk from conventional debt sources, and match the life cycle of green investments.
- Discounts and rebates: provided by suppliers to contractors and consumers to encourage adoption of new green technologies.
- Performance financing: to provide financing that shifts the risk to technology providers, and increased cash flow for the consumer that can be used to pay for the initial capital investment.
- Regulatory relief: to provide adjustments and allowances in the building plans and systems for the contractor, including accelerated permitting for energy-efficient building plans and development bonuses.
- Carbon trading: to raise additional capital from the sale of carbon credits on active trading markets, including the California market.[60]

These initiatives will provide market-driven, scalable, and sustainable solutions that address the needs of each of the stakeholders, allowing for a decoupling of the unnecessary tradeoff between economic growth and environmental protection. Rather, with the right tools, incentives, and approaches, they are mutually supportive.

CONCLUSION

By themselves, the financial tools, innovations, and approaches we've recommended are relatively simple. When combined, they provide powerful assists to the greening of Israel's domestic housing market.

We've already looked at frameworks to see how ministries and legislative committees might tailor them for new construction and renovations. That models should be structured for sustainability goes without saying; we can be sure that markets and goals will change.

The benefits? Imagine the satisfaction and national pride when tech companies can market domestically what they've been exporting with success. When developers can build the kinds of green structures and projects they only read about, or built abroad. When homeowners and tenants who want to contribute to a green planet will not be priced out of "doing their share." When investors and philanthropies can share returns, and participate in the social good.

As a developed country, Israel is demonstrating innovate ways of leveraging and managing growth. With new approaches to financing the introduction of green technologies into residential development, we will lead other nations, both developed and developing, in sustainable growth. There our footprint will be deep and wide in addressing the challenges of climate change with sustainable development innovative finance.

APPENDICES

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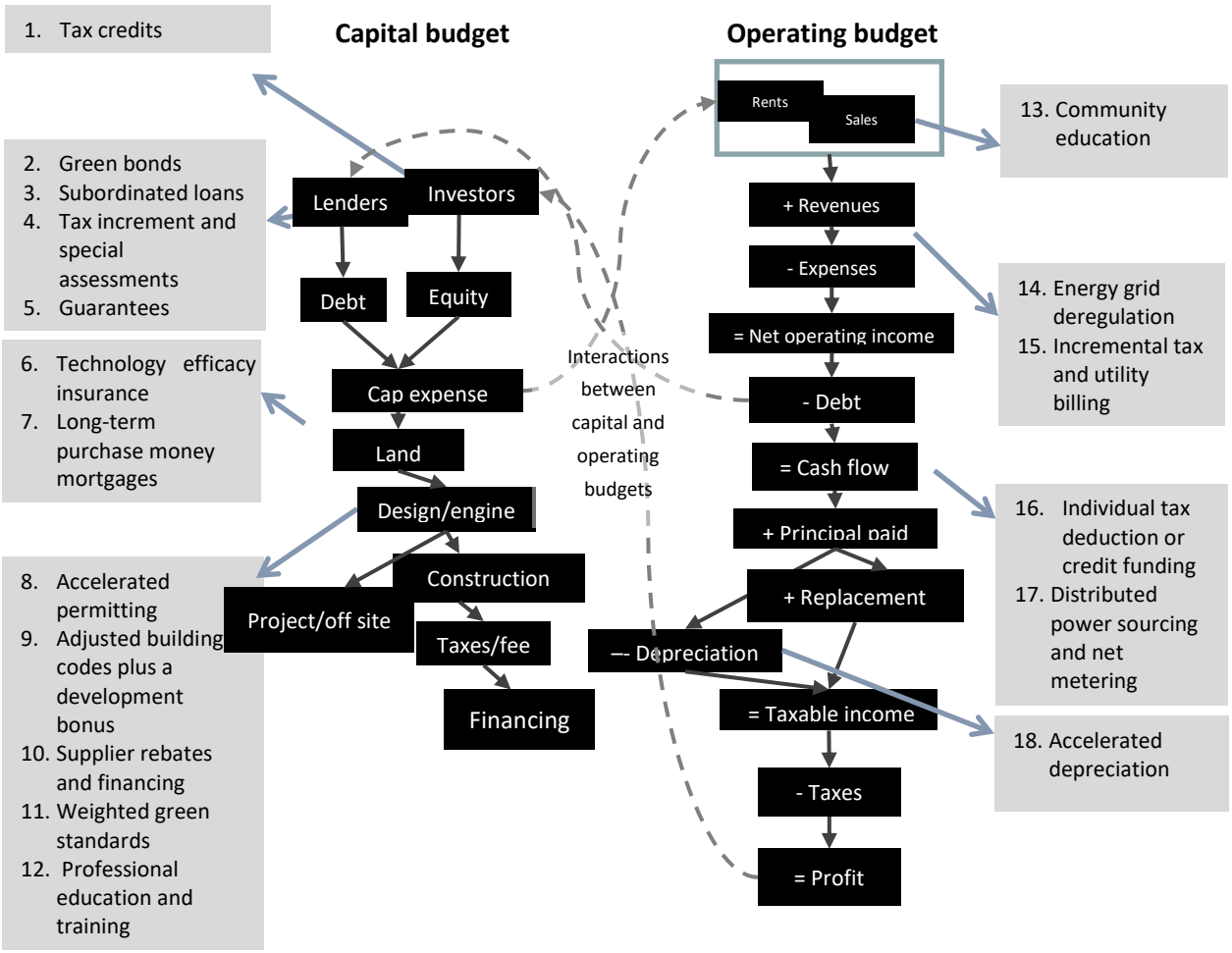
II. Tools and context

Lab participants discussed tools and approaches in the contexts of capital and operating budgets at the project level. Each tool has a role in enhancing project feasibility and outcomes.

FIGURE 20 Financial context for solutions



Source: Milken Innovation Center

The programs and tools fit into the capital and operating budgets in various ways. The following table briefly introduces each of these tools.

TABLE 6 Green building financial tools

	Green Building Finance Tool	What is it?
1	Tax credits	Tradable credit to equity investors on personal or corporate income taxes, based on eligible capital investment
2	Green bonds	Project financing secured by share of savings in the operating costs; project financing secured by subordinated mortgages to finance eligible construction and renovation projects
3	Subordinated loans	Subordinated debt to pay for the eligible green building improvements or new construction
4	Tax increments, special assessments	Project financing secured by tax increments or special tax assessment on eligible green buildings
5	Guarantees	Reserve funding to ensure green building operating performance and/or net operating income and payment of debt
6	Technology efficacy insurance	Insurance on the performance of the green technology to encourage the early adoption of new technologies and expansion of the market of manufacturers and suppliers
7	Accelerated permitting	Expedited reviews, approvals, permitting by public authorities
8	Adjusted building codes	Changes in code to accommodate green methods, materials, and systems; additional building rights for eligible projects
9	Rebates	Payment for a portion of a green building system, equipment, technology
10	Supplier financing	Performance-based financing to suppliers of systems and equipment
11	Weighting green standards	Shift of criteria for green construction to favor high-climate impacts
12	Professional education/training	Training for architects, engineers, planners, lenders
13	Community education	Education/training programs to inform about green building technologies, finances, and economic benefits
14	Energy grid deregulation	Open policy for competitive production and distribution
15	Increment tax or utility bill financing	Financing the incremental capital costs from the operating savings through incremental utility or tax bills
16	Individual tax deduction	Reduction in the tax payment due by the owner or tenant of an eligible building
17	Distributed sourcing and power purchase agreements (PPAs)	Allows sales to the power grid from individual homes and buildings; instituted to enable financing
18	Accelerated depreciation	Increases the amount deducted in the short term from net operating income to reduce taxable income

III. Green Building Assumptions

The estimate of capital costs and operating savings are derived from the analysis done on the Israeli market as part of the planning for the reduction of greenhouse gas emissions. The analysis, using the MACC Tool, examined each sector, including the residential sector, the uses and trends in various energy technologies, and the costs and impacts of the adoption of various green technologies. These estimates are based on the estimations of current and future capital and operating costs on a moderate to high scenario for each category. Lab participants stressed that as green technologies develop further and become better integrated into construction techniques, it is expected that the capital costs will decline as a percentage of the total project cost, and operating savings in increase.

These cost estimates were applied to the development scenarios included in the Lab presentation and this report.

TABLE 7

Green costs and savings assumptions (per square meter)

	Estimated capital cost of green technology (NIS per sq. meter)	Estimated operating expense savings from green technology (NIS per sq. meter)
Smart metering	24.00	(2.50)
Limescale (calcium carbonate reduction)	23.00	(0.05)
Lighting	5.06	(0.32)
Solar shading	66.00	(9.47)
Ground-source heat pumps	88.32	(2.14)
Air conditioning	5.00	(10.16)
Glazing	20.00	(1.63)
Insulation	60.00	(1.51)
Heating	60.00	(6.78)

Source: Marginal Abatement Cost Curve (MACC) Tool data, Milken Innovation Center

These cost estimates were applied to the development scenarios in the Lab presentation and this report.

IV. Project Models and Results

Lab participants reviewed two residential project models to demonstrate the financial structure of a single apartment[61] and a multi-family rental project. Single apartments within apartment buildings are usually owned and occupied by the owner, or rented. While there is not a robust market for what are called multi-family rentals elsewhere, efforts are under way to encourage this potential market. Even though a considerable amount of new housing is being built in the non-urban areas,[62] for purposes of discussion in the Lab, we assume urban locations, which add to the green efficiency by reducing commute times (as well as energy costs and greenhouse gas emissions).

The single apartment project scenario assumes new construction of 85 square meters at a total capital cost of NIS 1.56 million.[63] The base financing scenario assumes a 50 percent loan-to-value ratio, with the other half coming from the buyer's equity. Finally, the base scenario assumes a 2–5 percent premium paid in the capital costs.[64]

The single apartment project scenario includes a renovation of the 85-square-meter apartment at a total renovation cost of NIS 228,500. The base scenario assumes 100 percent loan-to-value ratio since the improvements are likely to done through a shorter-term, lower-cost home equity loan. The renovation project assumes a 10.4 percent green premium paid in the capital costs.

For multi-family project scenarios, the model includes a 50-apartment project at a total capital cost of NIS 58 million. This translates into a total capital cost per 80-square-meter apartment of NIS 1.2 million. This model also assumes a 2.5–5.5 percent green premium paid in the capital costs.[65]

The following shows results from the use of the tools discussed on two types of projects: for-sale apartments, and multi-family rental apartment buildings. The results show a step-wide use of various tools, showing the impacts, with various configurations of systems and improvements.

FIGURE 21

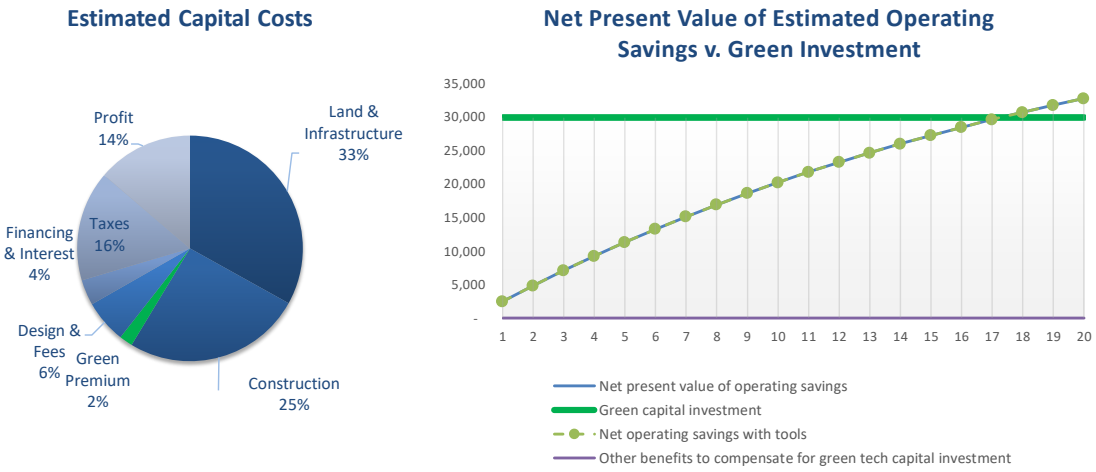
Scenario: single apartment, new construction, green technology installed, no financing tools

Apartment model
Capital structure and estimated payback

New construction - single apartment
Green technology installed (not including rooftop solar, appliances, or water savings)
No financial tools
Payback in Year 17

Tools	Active in scenario
Subordinated debt	No
PV solar net metering	No
Accelerated depreciation	No
Refundable Tax credit	No
Supplier performance payment	No
Payment from savings	No
Guarantee	No
Green increment financing	No
Purchase tax waiver	No

Sources of Funds	Amount	% of Total
Equity	780,780	50%
Debt - Senior	780,780	50%
Debt - Subordindate	-	0%
Supplier Financing	-	0%
Performance financing	-	0%
	1,561,560	100%



Source: Milken Innovation Center

FIGURE 22

Scenario: single apartment, new construction, green technology installed, financing tools

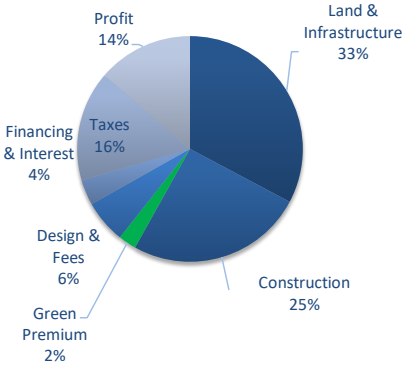
Apartment model
Capital structure and estimated payback

New construction - single apartment
Green technology installed (not including appliances, or water savings)
Subordinated debt, solar net metering, and special assessment based on savings
Payback in Year 5

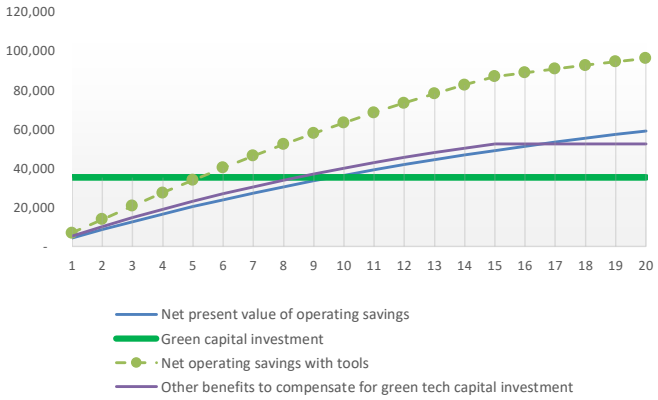
Tools	Active in scenario
Subordinated debt	Yes
PV solar net metering	Yes
Accelerated depreciation	No
Refundable Tax credit	No
Supplier performance payment	No
Payment from savings	No
Guarantee	No
Green increment financing	Yes
Purchase tax waiver	No

Sources of Funds	Amount	% of Total
Equity	788,313	50%
Debt - Senior	589,983	37%
Debt - Subordindate	157,663	10%
Supplier Financing	-	0%
Performance financing	40,668	3%
	1,576,626	100%

Estimated Capital Costs



Net Present Value of Estimated Operating Savings v. Green Investment



Source: Milken Innovation Center

FIGURE 23

Scenario: multi-family, new construction, green technology installed, no financing tools

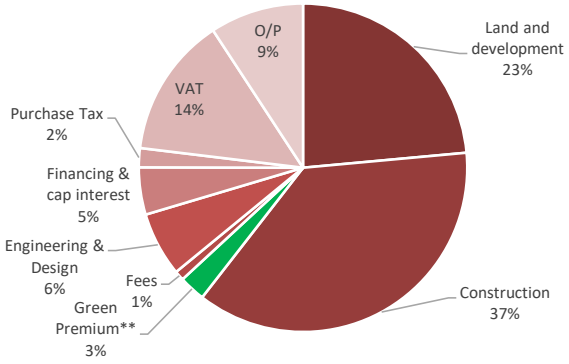
Multi-family rental
Capital structure and estimated payback

New construction - multi-family rental apartment
Green technology installed (not including rooftop solar, appliances, or water savings)
No financial tools
Payback from savings - Year 20+
Estimated return on equity in Year 10: 6%

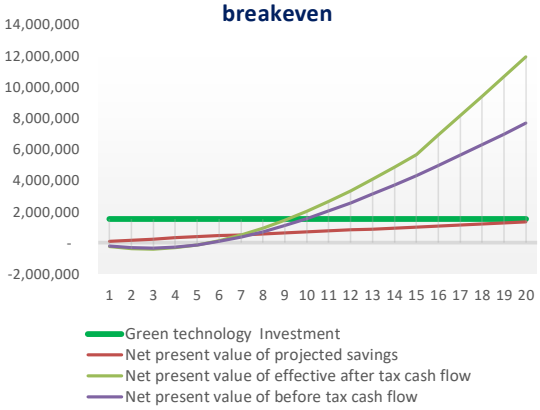
Tool	Active in scenario
Accelerated Depreciation	No
Subordinated Loan	No
Guarantee	No
Tax Credit	No
Supplier Financing	No
Performance Financing	No
PV Solar Net Metering	No
Purchase Tax Waiver	No

Sources of Funds		Amount (NIS)
Equity	30%	17,521,485
Syndicated Tax Credit Equity	0%	-
Senior Debt	70%	40,883,465
Subordinated Debt	0%	-
Supplier Financing	0%	-
		58,404,950

Capital Budget



Multi-apartment rental green investment breakeven



Source: Milken Innovation Center

FIGURE 24

Scenario: multi-family, new construction, green technology installed, financing tools

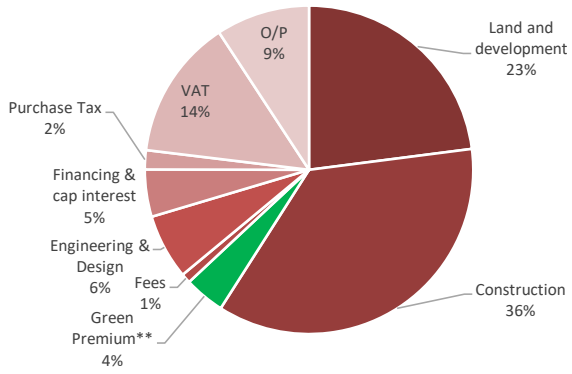
Multi-family rental
Capital structure and estimated payback

New construction - multi-family rental apartment
Green technology installed (not including rooftop solar, appliances, or water savings)
Accelerated depreciation, subordinated loan, guarantee, tax credit, solar net metering
Payback from savings - Year 3-4
Estimated return on equity in Year 10: 20%

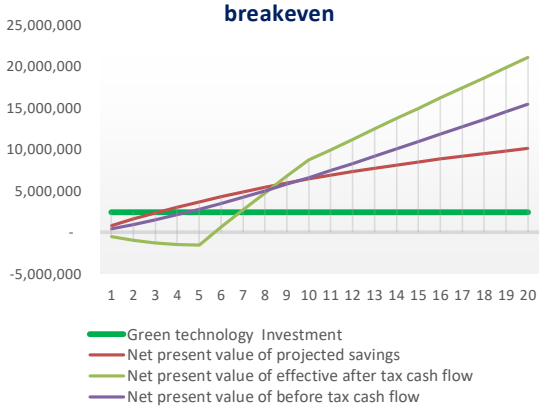
Tool	Active in scenario
Accelerated Depreciation	Yes
Subordinated Loan	Yes
Guarantee	Yes
Tax Credit	Yes
Supplier Financing	No
Performance Financing	No
PV Solar Net Metering	Yes
Purchase Tax Waiver	No

Sources of Funds		Amount (NIS)
Equity	12%	7,088,145
Syndicated Tax Credit Equity	18%	10,873,972
Senior Debt	55%	32,930,548
Subordinated Debt	15%	8,981,058
Supplier Financing	0%	-
		59,873,723

Capital Budget



Multi-apartment rental green investment breakeven



Source: Milken Innovation Center

V. Draft Outline for Green Fund Guidelines

1. Purpose

To provide access to capital to accelerate the use of green building technologies, materials, and equipment in residential new construction and renovations; to improve the energy performance of dwellings and lower greenhouse gas emissions

2. Eligible Applicants

a. Developers
b. Contractors
c. Green building suppliers
d. Apartment owners and operators

3. Eligible Activities

a. Construction: new construction activities on multi-family for-sale and rental dwellings
b. Renovation: renovations activities on multi-family for-sale rental dwellings
c. Ineligible activities: single for-sale dwellings

4. Eligible Improvements

a. Windows
b. Mechanical systems
c. Roof insulation and wall treatment (new construction only)
d. Sensors and meters
e. Other improvements, based on certification standards and changes in technologies

5. Terms and Conditions

a. Amount: up to 200 percent of the cost of the eligible green building improvements, but not more than 60 percent of the cost of the total project cost
b. Term: up to 150 percent of the depreciable life of the green improvements
c. Interest rate: a fixed annual interest rate set between prime+1 and Prime+3, depending on the level of environmental certification
d. Guarantees and Security:
    i. Developer or owner will be expected to provide a shared first lien, but not less than a second lien on the property
    ii. If applicable, an energy lien shall be placed on the property, obligating the owner to make an energy payment equal to 75 percent of the energy savings resulting from the green improvements

6. Criteria for Selection

a. Eligible applicant and proposed activities
b. Certification of green construction[66]
c. Pledge of adequate collateral and/or energy lien

ENDNOTES

[1] Sahadi, Bob, et al. "Home Energy Efficiency and Mortgage Risks." March 2013. Institute for Market Transformation, Washington, DC.; and David Gardiner & Associates. "Green Buildings and the Finance Sector." Report commissioned by the North American Task Force, United Nations Environment Programme. February 2010. Page. 8.

[2] The Electricity Market in Israel: A Proposal for Increased Efficiency by Changing Consumer Behavior," Lior Tabori, Milken Innovation Center, No 60, October 2012. [Hebrew] and the Ministry of Environmental Protection estimate of carbon emissions from residential development, 2015.

[3] ibid.

[4] "Global Cleantech Global Innovation Report." www.cleantech.com/indexes/the-global-cleantech-innovation-index/2014-report/

[5] Minicy Catom Software Engineering Ltd. www.catom.com. "The Samuel Neaman Institute for Advanced Studies in Science and Technology – Publications – Solar energy for the production of heat Summary and recommendations of the 4th assembly of the energy forum at SNI", 2012.

[6] David Faiman, "Solar Energy in Israel," Ben-Gurion National Solar Energy Center, Jacob Blaustein Institute for Desert Research, Ben-Gurion University of the Negev. www.jewishvirtuallibrary.org/jsource/Environment/Solar.html (accessed November 14, 2016).

[7] World Energy Council, Energy Efficiency Indicators, Average Electricity Consumption per Electrified Household, See https://www.wec-indicators.enerdata.eu/household-electricity-use.html, accessed May 2016.

[8] "Buildings and Climate Change, Summary for Decision Makers," United Nations Environmental Program, Sustainable Buildings & Climate Initiative, 2009.

[9] Israel Central Bureau of Statistics, Table 8. Gross Domestic Investment by Sector, 2014. Residential investment includes current public and private construction values in 2014. See http://www.cbs.gov.il/publications16/ 1633/pdf/t08.pdf. [Hebrew]

[10] This is a Milken Innovation Center estimate derived from the Central Bureau of Statistics of residential construction of gross fixed capital investment and green building technology construction increment.

[11] This is a Milken Innovation Center estimated based on the residential share of gross fixed capital investment and an estimated proration of total construction workers in all sectors.

[12] "National Report Israel," Drought and Arid Land Water Management. United Nations Commission on Sustainable Development 16-17. www.un.org/esa/agenda21/natlinfo/countr/israel/drought.pdf (accessed November 14, 2016)

[13] The Electricity Market in Israel: A Proposal for Increased Efficiency by Changing Consumer Behavior," Lior Tabori, Milken Innovation Center, No 60, October 2012. [Hebrew].

[14] Ministry of Environmental Protection estimate of carbon emissions from residential development, 2015.

[15] "Toward Affordable Housing in Israel," Financial Innovations Lab Report, Milken Institute, 2014. http://milkeninnovationcenter.org/wp-content/uploads/2015/10/Affordable-Housing-ENG.pdf (accessed November 14, 2016).

[16] Israel Central Bureau of Statistics, Construction – Selected Data, Table 22.1. Calculation based on construction area and number of dwellings per year from 1955 through 2015. See http://www.cbs.gov.il/shnaton67/ st22_01.pdf, last accessed 11/20/16. [Hebrew]

[17] Urban Land Institute Terwilliger Center for Workforce Housing, "Beltway Burden: The Combined Cost of Housing and Transportation in the Washington, DC. Metropolitan Area," 2009; see also, the Urban Land Institute's "Priced out: Persistence of Workforce Housing Gaps in the Boston Metropolitan Area," 2010.

[18] Stephanie Yatos Rauterkus, Grant Thall, and Eric Hangen, "Location Efficiency and Mortgage Defaults," *Journal of Sustainable Real Estate*. (November 2010) Vol. 2(1), pages 117-141.

[19] The risk of mortgage default is one-third lower for energy-efficient buildings. See Sahadi, Bob et al. "Home Energy Efficiency and Mortgage Risks." (March 2013), University of North Carolina Center for Community

Capital. Institute for Market Transformation, Washington, DC.; see also Andrew Sanderford, et.al. "Energy-efficient homes and mortgage risk," *Environment Systems and Decisions*, (March 2015). 35(1) 157–168.

[20] Jennifer Henry and David Goldstein, "Reducing Foreclosures and Environmental Impacts through Location-Efficient Neighborhood Design," National Resources Defense Council (January 2010); see also Gary Pivo, "The Effect of Transportation, Location, and Affordability-related Sustainability Features on Mortgage Default Prediction and Risk in Multifamily Rental Housing," FannieMae, May 29, 2013.

[21] These data are based on the "use driver" projection in the MACC tool.

[22] "Assessment of Greenhouse Gas Emissions Reduction Potential and Recommended National Target for Israel," Final Report, September 2015, pages 55-58. See http://www.sviva.gov.il/infoservices/ reservoirinfo/ doclib2/publications/ p0801-p0900/p0823-a.pdf

[23] Aden, Nate. "The Roads to Decoupling: 21 Countries Are Reducing Carbon Emissions While Growing GDP," 2016, World Resources Institute. www.wri.org/blog/2016/04/roads-decoupling-21-countries-are-reducing-carbon-emissions-while-growing-gdp (accessed November 15, 2016).

[24] Energy intensity is a measure of the energy efficiency of a nation's economy. It is calculated as units of energy per unit of GDP. High energy intensities indicate a high price or cost of converting energy into GDP. Energy intensity is used as a metric in the Margin Cost Abatement Curve analysis carried out by the Ministry of Environmental Protection.

[25] Sustainable Innovation Forum 2015, UNEP Climate Action. See www.cop21paris.org/; see also http://unfccc.int/files/meetings/paris_nov_2015/application/pdf/paris_agreement_english_.pdf

[26] "Costs and Benefits of Green Building in Residential Construction in Israel," Hagai Kot, 2013. [Hebrew]

[27] "Israeli Green Buildings: Costs and Benefits," Greg Kats, February 17, 2014, See www.sviva.gov.il/subjectsEnv/GreenBuilding/Benefits/Documents/Costs-and-Benefits-English.pdf (accessed November 15, 2016).

[28] This does not include trees and other plantings, or the placement of other buildings to provide shade, although both practices can be important additions to the energy efficiency and add to the green quality of the built spaces.

[29] Lab participants distinguished between fixed-asset investments and impermanent fixtures and equipment. So, while they are important component of lowering energy consumption, for the purposes of this discussion, appliances are not considered part of the green building investment or payback.

[30] "Toward Affordable Housing in Israel," Financial Innovations Lab, Milken Institute. September 2014; see http://milkeninnovationcenter.org/wp-content/uploads/2015/10/Affordable-Housing-ENG.pdf (accessed November 16, 2016); see also "Planning Residential Districts in Tel Aviv and the Center." (April 2014) Deshe Institute, Planners Forum, and Society for the Protection of Nature.

[31] The Israel Electric Company is a government services company. It is a fully integrated monopoly of power generation, transmission, and transformation, and distribution. The government regulates all aspects of the company, including the development of alternative power production sources and the ability to give credit or purchase power from non-IEC sources. See www.iec.co.il/EN/IR/Documents/FinancialReportsDecember2014.pdf (accessed November 15, 2016).

[32] In 2011, Israel implemented the IS 5281 compliance certification standards. In 2014, Forum 15, a group of Israel's largest cities and local authorities, adopted a new green building standard. Since 2014, 140 buildings complied with green building standards, 102 of which are residential buildings with 4,000 apartments. This represents approximately 10 percent of the new residential building market in 2014. As of 2016, this trend is improving, however, with an estimated 600 residential projects in construction. See www.sviva.gov.il/English/env_topics/GreenBuilding/Pages/GreenBuildingStructuresInIsrael.aspx (accessed November 15, 2016).

[33] Home prices and rents are rising rapidly in Israel (and have been over the past decade). Monthly prices for mortgages on new homes and rents for existing homes have risen to more than 30 percent of the average monthly income, which is the maximum level for a home to be considered affordable. See "Toward Affordable Housing in Israel," Financial Innovations Lab, Milken Institute, September 2014.

[34]. "Financial Tools for Green Building," 2015. Omri Carmon, Milken Innovation Center [Hebrew]. http://milkeninnovationcenter.org/wp-content/uploads/2015/02/97-HB-F-W.pdf; English summary:

http://milkeninnovationcenter.org/wp-content/uploads/2015/11/97-EN-S-W-Omri.pdf (accessed November 15, 2016).

[35] Jamison, Eliot, and David Schlossberg, "Insuring Innovation: Reducing the Cost of Performance Risk for Projects Employing Emerging Technology," (October 2011). National Renewable Energy Laboratory, Office of Energy Efficiency and Renewable Energy, US Department of Energy. https://financere.nrel.gov/finance/content/insuring-innovation-reducing-cost-performance-risk-projects-employing-emerging-technology (accessed November 15, 2016).

[36] Bob Blumenfield is a member of the Los Angeles City Council. Prior to his election in LA, he served in the California State Assembly and led the efforts to enact the enabling legislation that became PACE.

[37] National Association of State Legislatures, PACE Financing, 2016. See www.ncsl.org/research/energy/pace-financing.aspx.

[38] "Property Assessed Clean Energy (PACE) Loss Reserve Program." California State Treasurer website. http://treasurer.ca.gov/caeatfa/pace/index.asp (accessed November 15, 2016).

[39] "President Obama Announces New Actions to Bring Renewable Energy and Energy Efficiency to Households across the Country" White House Fact Sheet, August 27, 2015. See https://www.whitehouse.gov/ the-press-office/2015/08/24/ fact-sheet-president-obama-announces-new-actions-bring-renewable-energy

[40] Stephanie Y. Rauterkraus, Grant I. Thrall, and Eric Hangen, "Location Efficiency and Mortgage Default," *Journal of Sustainable Real Estate,* 2/1 (2010):117–141. See also, R. Brown et al., "US Building Energy Efficiency Potential," Lawrence Berkeley National Laboratory, University of California-Berkeley, September 2008.

[41] "FACT SHEET: President Obama Announces New Actions to Bring Renewable Energy and Energy Efficiency to Households across the Country," see https://www.whitehouse.gov/the-press-office/2015/08/24/fact-sheet-president-obama-announces-new-actions-bring-renewable-energy. (last accessed December 1, 2016.)

[42] ibid.

[43]. Environmental Finance Innovation Summit 2014, Goldman Sachs, February 2014. See http://www.goldmansachs.com/our-thinking/pages/environmental-finance-innovation-summit-2014.html (last access November 20, 2016)

[44] Examples of ESCOs including Ennovate, Benham Companies, Chevron Energy Solutions (acquired by OpTerra), Clark Energy Group, Lockheed Martin Services, and Brewer Garret.

[45] "Fact Sheet: President Obama announces New Actions to Bring Renewable Energy and Enery Efficienty to Households across the Country," The White House, Office of the Press Secretary, August 24, 2015, see https://www.whitehouse.gov/the-press-office/2015/08/24/fact-sheet-president-obama-announces-new-actions-bring-renewable-energy (last accessed November 20, 2016.)

[46] A similar arrangement was pioneered for individual home solar system by David Arfin, the entrepreneur in resident at Israel Clean Ventures in 2015. He later sold the business to Solar City, the largest rooftop solar system installer and owner in the US. Solar City is being acquired by Elon Musk of Tesla Motors.

[47] Tax credits and depreciation are useful to a developer who has taxable income from the investment. In some cases, these may be used by homeowners, but these benefits have significant impact at a larger scale (e.g., large capital investments to depreciate or substantial equity that can be leveraged through tax credits). See www.seia.org/research-resources/solar-power-purchase-agreements (accessed November 16, 2016).

[48] "An Analysis of the Effects of Residential Photovoltaic Energy Systems on Home Sales Prices in California," Hoen, Ben, Wiser, Ryan H., Cappers, Peter, and Mark A. Thayer. (2011) E. O. Lawrence Berkeley National Laboratory, April. See https://eetd.lbl.gov/publications/an-analysis-of-the-effects-of-residen (accessed November 16, 2016). Based on data from 2000–2009, for an average installation of a 3,100-watt PV system, the investment adds a premium of about $17,000 to the market value of the home ($20,200 if adjusted for inflation to 2016).

[49] "Increasing Rural Energy Access through Mini-Grids," (2014) Knowledge Note, Climate Investment Fund, March. See www-cif.climateinvestmentfunds.org/knowledge-documents/increasing-rural-energy-access-through-mini-grids (accessed November 16, 2016). In addition, Claire Kaufman, a Milken Global Fellow from UC Berkeley, designed a model on the use of mini-grids in Burundi for Gigawatt Global (2016).

[50] Government Decision 542 provided NIS 500 million in government guarantees and NIS 300 million in appropriations for 2016-2019 in support for the adoption of energy savings technologies and increasing energy efficiency, including alternative energy production. (see http://www.sviva.gov.il/InfoServices/ReservoirInfo/DecisionStockpileGovernment/Pages/2015/Decision542.aspx)

[51] The combination of market rate and impact bond buyers will accommodate a range of bond prices based on risk preference, including subordinated tranches offering first loss to senior bond buyers.

[52] The New York Green Bank, a $1 billion green investment vehicle focusing on clean energy projects, is supported by an allocation of incremental ratepayer collections. See "NY Green Bank, 2016 Business Plan," June 27, 2016, page 19, for more information about the structure and capitalization under the State of New York's Clean Energy Fund. https://greenbank.ny.gov/About/Public-Filings (accessed November 16, 2016).

[53] The use of a public auction could be supported at the government level as a way of bundling residential carbon credits and selling them into a competitive carbon market. Currently, the European market does not offer a competitive price for carbon credits, and the government might pursue entry into the carefully regulated and competitive California carbon market.

[54] Based on a projection scenario for the Green Fund, an appropriation of approximately NIS 200 million would be used to supplement the repayment of the bonds. These green budget appropriations would average about NIS 23 million per year for up to 10 years. The projections also include an estimated green levy on homeowners and/or tenants starting in year 5 of approximately NIS 300 per year or about 10% of the estimated annual savings for a household.

[55] At a monthly gross income of NIS 12,500 per work, we estimate an average of 1,700 workers employed in the installation of green building systems. Finally, we assume a 15–25 percent tax rate on gross income for construction workers and 17 percent value-added tax (VAT) on all costs.

[56] This assumes that approximately 50 percent of the workers' wages, and equipment and materials purchases, are new to the project. The other portion would be spent for traditional systems, so they are not included in the net new totals for income or taxes.

[57] The projected public costs are based on an internal estimate of the cost of the revolving loan funds, tax credits, and other direct public support for the creation and operation of the Green Fund. These estimates are adjusted, based on the discussion of direct program costs included in the Ministry of Environmental Protection's report "Recommendations on Reducing Greenhouse Gas Emissions in the Building Sector," September 2016, [Hebrew].

[58] Using the base investment year 2015, we estimate that the total cost for construction will be NIS 15,000 per square meter (the average for a new apartment building in the center of the country in 2015) and will rise by 1.5 percent per year. Using the models in our analysis, we estimate that green construction will account for approximately 4 percent of the total investment, and that the labor component of the green construction accounts for 30 percent of the total green construction cost. Further, we estimate that green construction will capture about 10 percent of the total residential construction activity. Finally, we estimate that the green construction shares of the market of total residential increase by 5 percent per year.

[59]Solar Photovoltaic is a technology that transfers sunlight into energy that is used or stored by batteries. Solar PV are usually installed on rooftop arrays for residential buildings. Increasingly, they are being deployed on building facades, to maximize the useable areas or on adjacent buildings with larger rooftop areas.

[60] California has the only active and viable carbon trading market, carefully regulated and well managed. The state has opened its market to carbon credits in Canada, so there is a precedent for the sale of credits on the California market. Discussions began on access to the California platform during the COPS21 Conference in Rome in 2015, and with the California Governor's Office through the California-Israel Global Innovation Partnership.

[61] While it is unlikely that a single apartment will be built, this model illustrates the likely payback and return on capital to the initial investor/developer since they will market the for-sale apartments by advertising that the additional green investment pays back well and quickly.

[62] Non-urban area is defined as residential areas built outside of the traditional urban, built-up areas, requiring new road access, new water and sewer, and converting agricultural or environmentally-sensitive areas for development.

[63] The single apartment assumes approximately one-third of the cost on land and land development, and other expected costs, such as fees, design and engineering, financing, interest, overhead, and taxes, for a total all-in cost of approximately NIS 18,370 per square meter.

[64] In preparation for the Financial Innovations Lab, we use data from the marginal abatement cost curves (MACC) tool developed in conjunction with the Ministry of Environmental Protection as part the report titled "Assessment of Greenhouse Gas Emissions Reduction Potential and Recommended National Target for Israel," September 2015. The capital and operating costs and operating savings (as well as greenhouse gas emissions savings) are included for each green construction measure used to develop marginal abatement cost curves (MACCs).

[65] In neither of these project scenarios do we assumed rooftop PV solar systems, which will add another 1.5 percent to the capital cost of the project, depending on the system and size of the project.

[66] The Ministry of Environmental Protection and the Israel Green Building Alliance have been working on the implementation of several criteria, including the adoption and translation of LEED certification criteria and HERS (Home Energy Rating Index) Index standards for appliances and buildings systems. The HERs Index is the industry standard for measuring a home's energy efficiency, used for home inspections.

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