

# Green Mortgages & Renovation Loans

A toolkit for Financial Institutions



## Paying less for more!

Increase Asset Values



Reduced Mortgage Default  
& Other Credit Risk



Improve Cash Flow for Borrowers  
for their Green Homes



Assure expected green  
performance through credible,  
low cost, certification programs



Greater Environmental  
Responsibility for our  
Planet



CERTIFIED BY



# Introduction

*A successful and growing initiative that combines rewarding the greenest residential projects with innovative, discounted green financing, with awareness-building activities for homebuyers, with an accessible and widely-promoted GreenHomes. Solutions database for helping project design teams find and learn about your solution!*



AMBER GARDENS BY ALESONOR. A NET-ZERO ENERGY HOME ELIGIBLE FOR A GREEN MORTGAGE

**i** As of July 2020, the Green Homes program has certified or has signed agreements to certify over 10,000 housing units in Romania representing over €1.500.000.000 of residential project value.

## Executive summary

Supporting the creation of **Green Homes** through a credible, cost-effective certification program represents an opportunity for residential investors & developers to differentiate the quality and environmental performance of their construction projects while educating consumers about the financial and other benefit. Financial institutions – through the issuance of **Green Mortgages** tied to certified Green Homes – can significantly reduce their mortgage default risk and raise the asset valuation of homes they finance and can, therefore, offer a lower cost of financing. Lower financing costs provides the homebuyer with greater purchasing power to invest in improved construction quality as the Green Mortgage accurately values the significant reduction in energy, repair and health costs of those who purchase Green Homes. Green Mortgages will also help the Romanian marketplace better appreciate the positive value of sensible borrowing to invest properly at the beginning of the building process. This initiative creates a consortium between a bank, the investor/developer, the home buyer and the certifier to certify green

residential projects that are environmentally-responsible and energy efficient relative to the standard offer in Romania generating financial, social and environmental benefit. Increased energy savings and other financial benefits (such as improved occupant health and less frequent/ lower home repair costs) substantially reduce the mortgage default risk allowing the lender to lower the monthly interest rate while maintaining profit margins. This enables the home buyer to invest into a more energy efficient and greener home while lowering their total monthly cost of ownership relative to a standard home.

The project is strongly supported by the **European Commission's Directorate General Energy (DG Energy)**. It is also on the forefront of aligning the green home certifications with the **Directorate General Environment's (DG Environment's) Level(s) framework** to include **embodied carbon/ Life-cycle Assessment and success towards a Circular Economy**. The project is being implemented by Green Building Councils and national Energy Agencies and

supported by leading academic institutions including the Université Libre de Bruxelles and the Copenhagen Centre on Energy Efficiency; A partnership of the United Nations Environment Program and Danish Technical University.

The introduction of such a financial product is very timely in the context of the current and impending European Directives that require progress toward Net Zero Energy Buildings, significantly reduced construction waste, and reduced toxicity of building materials compulsory for all new and existing residential buildings. Growing energy security concerns and rising energy costs reward residential projects that require less costly and natural scarce resources to build and operate. By contributing to the creation of certified Green Homes, residential investors and developers can greatly facilitate a rapid and profitable transformation of the construction and real estate industry toward a low carbon/green economy.



This work revised from 1 August 2014 is licensed to the SMARTER Finance for Families consortium, and the Romania Green Building Council and under a Creative Commons Attribution-Non-Commercial-No Derivatives 4.0 International License.

For information please see <http://creativecommons.org/licenses/by-nc-sa/4.0/>

This replaces the license from the version Romania Green Building Council created in April 2008.

# Table of contents

Opportunities & challenges for Romania's homes	4
What is a Green Home?	7
Assessing green performance of projects to determine qualification for Green Finance	8
How does the "Green Homes certified by RoGBC" Program work?	9
What are the typical costs to the Project Developer for RoGBC's Green Homes certification?	10
What is a Green Mortgage?	11
How does the RoGBC Green Mortgage programme work?	12
Green Mortgage Eligibility Process	13
Responsibilities & Benefits from the program	14
Other Benefits to Stakeholders	15
Assessing Renovation projects for eligibility for Green Finance products?	16
Green Renovation Loan Eligibility Process	17
Risks and mitigating factors	18
About the Romania Green Building Council	19
Authors and researchers of the Green Homes certified by RoGBC and Green Mortgage program	20
Frequently asked questions	21
Reference notes cited in this toolkit	22
<b>Appendix 1: Multi-Family</b>	<b>23</b>
Assessment criteria for Green Homes certified projects New Construction & Major Refurbishment, Renovation & Retrrfits	
<b>Appendix 2: Single Family</b>	<b>25</b>
Assessment criteria for Green Homes certified pojects New Construction & Major Refurbishment, Renovation & Retrrofits	
<b>Appendix 3</b>	<b>27</b>
Financial example for Green Mortgages	
<b>Appendix 4</b>	<b>28</b>
Selection of projects for RoGBC's Green Homes & Green Mortgage program	

# Opportunities & challenges for Romania's home



Romanian energy costs as a percentage of family income are the 2nd highest in the European Union.

There is a direct correlation between the energy efficiency and green performance of a home and the level of quality in the design, construction and operation of that home. Fear of bank financing often leads homeowners to make suboptimal decisions and underinvest in the design and construction process (often choosing homes only on the lowest "Cost per Square Meter" value) and resulting in owning homes that are more costly to heat and cool, require more maintenance, more frequent renovations, and subject to reduced long-term asset values relative to Green Homes.

**Certified green homes have a 9% increased selling price relative to standard. The green homes in the study averaged 20 to 30% savings in energy and water use compared to code-built homes.**

The most cost-effective moment to invest in energy efficiency and other green features of a home is at the earliest moments of its initial design and creation. This is particularly true regarding the "building envelope" or the roof, windows and walls which contribute substantially to energy efficiency performance but are costly and problematic to improve after the initial construction is complete.

In a 2013 study of 71,000 homes comparing default risks in Energy Efficient and Green Homes to standard homes, a 32% reduction in mortgage default risk was found in the Green homes. The study also found that homes that exceed the minimum standard to be considered "green" for the study exhibited an even higher reduction in default risk. The annual energy savings for green homes can be equal to one or two mortgage payments per year.<sup>1</sup>

Another comprehensive academic study found mortgage defaults were:

- 32% less likely if the apartment building is within a mile of protected open space;
- 34% less likely if the building is in a neighborhood with at least 16 retail stores; and
- 58% less likely if in an area where at least 30 percent of workers commute by subway/elevated train.<sup>2</sup>

A study of over 1.6 million homes in North America released in June 2014 concluded certified green homes have a 9% increased selling price relative to standard. The green homes in the study averaged 20 to 30% savings in energy and water use compared to code-built homes. A lower level of code and similar low energy prices indicate the market can expect similar price premiums/asset values for certified green homes as the study identified.<sup>3,4</sup>

Some of the most prevalent reasons for early damage to a home effecting ongoing energy efficiency, visual appeal and asset value include insufficient and/or improperly installed thermal and hydro insulation. Green building solutions, by design and by definition, must be durable and therefore reduce the frequency and severity of repairs to a home.

Health issues of the borrower or a family member have material impacts on the ability to pay financial obligation. Holding healthier homes in mortgage portfolios will have a material, positive financial benefit from reductions in accidents:

- from better lighting and properly installed electric wiring;
- from exposure to volatile organic compounds (VOCs), formaldehyde, asbestos, lead, mold, and radon through choosing healthier building materials and utilizing proper insulation and renovation techniques; and
- from exposure to carbon monoxide and tobacco smoke from better ventilation.

Sensible financing is the best choice to bring forward the available resources early into the construction process of homes allowing the homeowner to offset their early investment in quality and energy performance (via monthly mortgage payments) with the savings (via reduced monthly energy and repair bills). Each of the above points indicate banks underwriting mortgages can offer lower costs of financing without loss of profitability due to better repayment rates and higher long term values of the properties they finance. The points that follow offer additional benefits from supporting greener homes.

Buildings account for over 30% of total energy consumption and 40 to 50% of CO<sub>2</sub> emissions in Europe.

The current buildings regulations and achievement of an "A" on the Romanian Energy Performance Certificate require only a low level of energy efficiency which leads to high energy costs for the end-users during the period of ownership. Furthermore, the energy audit process is inconsistently applied and leaves little incentive for a developer/investor to aim for higher performance as they fear buyers will not be able to recognize the existence of superior building energy performance.



Key EU-driven legislation will dramatically improve the quality, energy and green performance of homes beginning now and increasingly over the coming years. This includes:

- Nearly "Net Zero Energy Buildings" by 2020 requiring ultra low energy buildings with any energy use required offset by production of green energy;
- The amount of Construction Waste required to be diverted from landfill, currently approximately 25%, to be increased to 70%; and
- Significant restrictions on toxic chemicals allowed in building materials and requirements to disclose the chemicals used in materials production (e.g. REACH legislation).

Sensible financial mechanisms such as Green Homes & Green Mortgage programmes prepares the Construction and Real Estate industries for this impending legislation ensuring that green building pioneers have the financial tools to deliver homes to the market today or in the near future that include a strong business case for all stakeholders.

Most countries - and all in the European Union - require Energy Performance Certificates for new buildings and during significant events for existing buildings such as sales, rentals, and major upgrades. The cost of the energy audit, therefore, no longer represents an optional or additional cost but a required cost of the real estate developer.



The Romania Green Building Council organizes the Green Home Pavilion@ TNI in partnership with the National Real Estate Fair held twice yearly in Bucharest. The Green Home Pavilion showcases the country's exemplary green residential projects and the solutions that made them possible. RoGBC also delivers presentations about the financial, health and other benefits of Green Homes. It is a chance to interact with both the



home buying public and active real estate developers and investors. Green Home Pavilion@TNI has proven to be the most popular exhibit at the tradeshow and continues to add partner developers and solution providers, demonstrating the growing interest in sustainable construction approaches in Romania.



SANELA KLARIĆ PRESENTING GREEN HOMES GREEN MORTGAGES AT @MOSTAR GREEN DESIGN BIENNALE IN BOSNIA & HERZEGOVINA

## Implications

### Economic

The increasing energy costs and relative insufficient energy efficiency in homes will constantly be augmenting the strain on households' available monthly cash and limiting the ability to pay debt obligations. Poor building quality increases maintenance/repair costs and reduces the future market value of homes in the event they must be repossessed by the bank; raising potential losses of mortgage portfolios and raising the cost of borrowing for potential homeowners.

### Social

Loss of energy subsidies without adequate preparation will affect all households for all income levels. This does, however, disproportionately affect the low and middle-income class of the population as the energy bill is a higher percentage of their income and they generally live in lower quality (hence lower energy efficient, albeit smaller) houses.

Unstable energy security reduces policy options to confront aggressive petrol driven countries leading to increased or prolonged conflict.

### Environmental

At the planned rate of construction, the negative impact on the environment of home construction is increasing significantly, as well as the stress on the stock of conventional fossil fuels and on the supply of natural resources.

**Given a growing supply of conclusive evidence concerning the challenges with the security and projected long-term costs of conventional energy supplies, and the lower maintenance costs of green homes, 'business as usual' is the risky choice for banks wishing to minimize risk in their mortgage loan portfolios.**

Steven Borncamp  
Project Director, SMARTER Finance for Families  
Lead Author, Green Homes & Green Mortgage program

## Need For Action

In consideration of the above facts and implications, engaging the financial industry, residential investors/developers and those that provide the necessary solutions to develop energy efficient and environmentally-responsible homes are a necessary and economically-preferable solution to reduce the financial risk of mortgage portfolios and "future proof" homes for upcoming conditions in the near and long term. Banks' mortgage portfolios will perform better if homebuyers select sensible, cost-effective homes with the long-term financial outlook of the property considered at the time of taking the mortgage and purchasing the home. The role of investors/developers and green building solution providers in leading the way is of paramount importance.

## What does the market think?



*EnR feels that SMARTER Finance for Families will be a benefit to the objectives of the European Energy Agency due to:*

*An innovative approach to unlocking essential, additional construction budgets for residential projects without elevating the monthly cost to homeowners/homebuyers.*

*Actions to improve the credibility and appreciation of Energy Performance Certificates as a valuable tool for important stakeholders such as the banking industry, as well as citizens and government agencies charged with improving energy efficiency and promoting green energy usage.*

*The intent to better leverage public financing by creating "hybrid" solution to Energy Poverty that promises to serve more citizens while making this challenging market more appealing to private sector banks.*

### **Ilaria Bertini**

Head of ENEA's Department for Energy Efficiency



*We believe that the project "SMARTER Finance for Families" will contribute significantly to meeting sustainable development goals through proposed measures to expand successful Green Homes & Green Mortgage programmes to new European markets, and to develop essential supporting tools for these programmes.*

### **Scott Foster**

Director Sustainable Energy Division



*We think that collaborative efforts putting together sustainability excellence with the banks to reward the lower risk of greener homes with discounted interest rates will greatly help the residential market grow in the best interest of all involved stakeholders.*

### **Umberto Irti**

Managing Director COAF SRL

# What is a Green Home?

There are many valid approaches to creating a Green Home but all are thoughtful in their design, construction and operation and minimize or eliminate the environmental impact of the creation and operation of the home. Here are some of the main components of Green Homes:

## Energy Efficiency & Green Energy

Using "Bio-Climatic Design" principles (explained further below), a superior "Building Envelope" with significantly improved insulation and better doors and windows, and more efficient Heating, Ventilating, and Air Conditioning (HVAC) or natural ventilation and "Passive House" approaches; a Green Home minimizes energy use. Introduction of Green Energy – either on the home itself or through specifying contractually the delivery of Green Energy through Energy Suppliers ensures the reduction or elimination of fossil fuel derived energy.

## Location

The construction of a green home does not utilize land with important contributions to biodiversity or a city's green space. The location reduces transportation impacts by having access to public transportation or rail or bus terminals and/or is in a "walk-able" community with the homeowner's needs for shopping, dining, schools, etc. nearby.

## Sustainable & Healthy Materials

Green Homes utilize materials that are nontoxic to the home's occupants and safe in their production. Heavy construction materials are chosen that are manufactured close to the construction site to minimize transportation impact. Materials that contained recycled materials or, better, creatively "up-cycle" or "re-purpose" items that might otherwise end up as waste should be included. Durable materials mean less repair costs, less construction waste, and reduced environmental impact over time.

## Indoor Air Quality

Technology solutions or natural ventilation (or both) are employed to ensure air is both healthy and pleasant. Paints, other coatings and adhesives are chosen that do not introduce toxins into the home.

## Bioclimatic Design: Lighting, Shading and More

Green Homes use "bioclimatic design" principles that include shading from the summer sun and collecting the winter sun with thoughtful orientation of the building and placement of the windows and skylights. Deciduous trees drop their leaves in winter to allow in sun and evergreen trees keep their leaves to protect against harsh winter winds and "solar gains" from summer sunshine. Indoor lighting is designed to ensure a safe, productive, and warm environment with a minimum amount of energy use. Designs that ensure natural daylight enters the building without solar gains in summer contribute to a Green Home.

## Construction Site and ongoing Property Management

The construction process of a green home takes important steps to ensure the building does not damage or destroy the surrounding environment (reducing/eliminating erosion, protecting existing trees and biodiversity on the site). In addition, residents receive information and have facilities (e.g. Composting area, Recycling Collection area, etc.) to operate their homes in an environmentally-responsible manner to ensure the home over time has a neutral to positive impact on the planet. Landscaping is created using prolific and indigenous plants to minimize "Urban Heat Islands", reduce the need for pesticides, fertilizers and irrigation systems.

## Other Green Design Principles

Green Homes are designed to be durable to minimize repairs and heavy construction work if future needs changes. Smart design allows for different uses of the home as a family's needs change or new owners arrive with different needs. Green building principles demand better planning efforts and "Integrated Design" of the different disciplines to ensure optimal results, maximizes the use of space, avoid costly construction mistakes, and minimize waste

## Green Homes Scorecard

This scorecard of criteria (see Appendix 2) provides a full understanding of the criteria that need to be achieved to be certified as a Green Homes approved project. The scorecard for both single family and multi unit homes are available in Appendix II of this toolkit.

## What does the market think?



*We are confident that this project would provide a great benefit to our building industry and the citizen building potentially attractive programs to significantly increase consumer engagement and uptake of Green Homes.*

**PhD Alexandra Velická**  
General Director



*We have successfully collaborated with the Romania Green Building Council in a joint implementation of green finance initiatives and we believe the activities supported by the SMARTER Project will have a crucial positive contribution to our current and future green finance offerings as well as help improve the building industry's capacity to deliver better, safer and healthier homes to the Romanian customers.*

**Vladimir Kalinov**  
Vice President Raiffeisen Bank Romania



*Helping projects with energy efficiency and green performance differentiate themselves from their competitors using credible energy performance certificates, green certification and significant energy efficiency measures in general is part of our Green Lending strategy. Our organization will participate in the planned education and capacity building activities to support Green Housing loans.*

**David Gabelashvili**  
Director JSC ProCredit Bank Georgia

**Levan Khmiadashvili**  
Energy Efficiency Expert



*Homes' Construction and Renovation using ambitious energy efficient and green standards will create opportunities for greener energy sources as well as assist out citizens in the form of lower energy bills and greater heating and cooling comfort, combating energy poverty.*

**Ivaylo Aleksiev**  
Executive Director

# Assessing green performance of projects to determine qualification for Green Finance

There are two types of processes to be considered when assessing the eligibility of projects for Green Finance products.

The first process includes full or **holistic projects** where the green assessment would provide a certification of the entire project. This type of assessment would be most suitable for projects including:

1. new construction of a homebuyer's own home
2. new construction by a professional developer of a multi-family apartment complex, townhomes or villas for resale or
3. a "deep" renovation by a homeowner or professional developer resulting in a substantially changed residence and likely necessity of a secured mortgage (e.g. >10.000EUR of investment)

This process requires a dedicated Green Homes assessor and Energy Auditor to advise on the required criteria and certify the achievement of this criteria upon project completion. This type of process is particularly useful for a new construction as a larger number of green criteria can be implemented in the project (including, for example, choosing land with little or no environmental impact, good public transit connectivity, and walkable proximity to essential and desirable amenities).

This process is described in the next section entitled "**How does the 'Green Homes certified by RoGBC' program work?**".

The second type of process to be considered includes **smaller renovation projects** where homeowners' scope of work does not allow the full range of green criteria to be applied yet still deserve to benefit from Green Finance products. Here lenders can incent the purchase and finance of building materials, products, technologies and services which have substantially improved environmental qualities. The substantial number of projects and relatively low investment value may make these projects less practical to provide a dedicated Green Homes assessor. For these projects, a selection of "pre-approved" solutions that qualify for green financial products is appropriate.

This process is described in the section entitled "**Assesing Renovation projects for eligibility for Green Finance products**".



CERTIFIED BY







# How does the “Green Homes certified by RoGBC” program work?

The advisory and certification process works to ensure, a real estate investor/developer/homeowner building or renovating a home (hereafter referred to as “Project Developer”) successfully meets the program’s criteria (listed for both Multi-family and Single-family residences in Appendix 2 of this document). The process includes a close collaboration between the Romania Green Building Council, the Project Developer seeking certification for their project, and the project team and solution providers who will undertake the necessary actions. The Steps include:

## Planning a Green Residential Project – Preliminary Review

Project Developer considering certifying their project can request a “Pre-Certification Review” with RoGBC to – in a no cost or low cost manner – quickly assess the feasibility of obtaining a Green Homes certification by RoGBC. The Project Developer meets with the RoGBC to discuss the project (site location, building or renovation approach, energy performance, pricing target, etc.) they intend to pursue. The process includes an estimated 2 hour meeting from which the RoGBC will produce an initial indication of the feasibility in a point-by-point comparison with the established criteria.

NOTE: Project Developers are strongly advised to begin this process as early as possible, even before a site has been selected. Projects that have already begun construction can be considered for the RoGBC Green Homes certification program, but they will be held to the same requirements as projects that pursued certification from inception.

## Registration and signing the “Pre-Certification Agreement”

The Project Developer wishing to proceed with the Green Homes certification by RoGBC registers the project and pays the registration fee. The RoGBC, working with the project team and the information already collected at the Pre-Certification Review further defines the achievable criteria. The Project Developer and RoGBC agree upon which criteria will be achieved that provide the minimum score necessary and all mandatory requirements to satisfy the established criteria of a Green Homes certified project.

A “Pre-Certification scorecard” is signed by the Project Developer indicating the actions to be taken and the method upon which they will be assessed. Upon the signing of this document, the Project Developer can begin to market their project as “Green Homes Pre-Certified by Romania Green Building Council” informing potential buyers about the program and the green criteria they are pursuing. For those projects eligible for RoGBC’s Green Mortgage program offered with a partner bank, this is also an indicator that this potential financial benefit can be mentioned (see “How does RoGBC’s Green Mortgage program work?” section below

## Guidance toward a Green Homes certified residential project

The RoGBC and a qualified energy auditor, whose work is verified by RoGBC’s trusted energy auditors, meet and advise the project’s design team throughout the design, construction, and commissioning process to guide the project to successful achievement of RoGBC Green Homes criteria. Using the criteria agreed to be pursued as listed in the Pre-Certification Scorecard and encouraging “Integrated Design”, the process is designed to ensure projects meet or exceed compliance with the program’s requirements and produce no negative surprises at the conclusion of the project. Through the RoGBC’s “Green Homes Approved Solution Provider” program, project teams can readily identify companies with the technology, materials, other products and services that will contribute to achieving the necessary green criteria for the project.

## Designation of the residential project as a “Green Homes certified by RoGBC” approved project”

upon project completion, RoGBC and a qualified energy auditor review the project as constructed to confirm the criteria as agreed in the Pre-Certification Scorecard have been achieved. The RoGBC will check that the new owners are provided adequate information to operate their home in an energy efficient and green manner. The project team is provided the final scorecard and either a notification of successful certification of the project or indications of remaining corrective actions to be taken.

## Offer a Green Mortgage to Home Buyers

Projects pursuing the “Green Homes certified by Romania Green Building Council” designation should discuss early in the process with participating banks who agree to underwrite Green Mortgages that receive discounted financing costs based on the green performance and reduced operating costs of the homes (see “What is a ‘Green Mortgage?’” in the next section).

## Monitoring of the Program

Recipients of Green Homes certification agree to share energy cost data of their homes and to operate the units as advised upon purchasing the home. The data will be useful to inform the various stakeholders of the environmental and financial outcomes of the program and contribute to future improvements.

# What are the typical cost to the Project Developer for RoGBC's Green Homes certifications?

The program is designed to expedite and encourage widespread adoption of greener industry practices. The program has a very modest price structure designed to provide the necessary resources to administer a high-quality coaching and certification process while not causing an undue burden on the partners participating in the program.

## For Homebuyers

There is no cost to participate to the homebuyer. They are, in fact, rewarded substantially through a lower monthly cost of ownership and better quality, healthier home than the standard offer.

## For Residential Investors/Developers

The following table includes the total fees to certify a residential project. The Pre-Certification fee, if any, is due prior to initiation of the review. The Registration fee includes creation of the Pre-Certification agreement signed between the Investor/Developer and RoGBC.

Multi Family Apartments	Non-Members	RoGBC Members
Pre-Certification Review	€150	FREE
Registration	€1,100	€875
Certification	€65 per unit	€52 per unit
Integrated Environmental Assessment	€4,225 per building	€3,575 per building

The full project must be certified (i.e. not only those units that are transacted via a participating banks' Green Mortgage offer).

Single-Family Housing / Detached Units	Non-Members	RoGBC Members
Pre-Certification Review	€150	FREE
Registration	€700	€200
Certification	€475 per home	€375 per home
Integrated Environmental Assessment	€2,400 per home*	€2,000 per home*

\* Cost is per unique home plan that requires separate evaluation (i.e. this is only charged once on multi-unit projects replicating the same plan and construction approach)

## Note:

Fee structure valid for Projects Registered with initial fee paid by 30 April 2020. To ensure an accurate, mutual understanding, investors/developers are encouraged to discuss the project's fee structure at the Pre-Certification review. Reasonable Travel expenses, if necessary, must be reimbursed. The necessity of travel will be determined at the Precertification Review to ensure full understanding of the costs prior to initiating the full certification process.

# What is a Green Mortgage?

A Green Mortgage is a unique home mortgage product offered by participating banks that reward the purchase of a certified Green Home with a discounted interest rate due to the reduced mortgage risk, default and higher home values associated with Green Homes versus standard homes.

Per the definition above, a certified Green Homes residential project will have significant reductions in the utilities and repair bills allowing households to save extra cash that can be applied to paying back their mortgage. This additional monthly income for the homeowner significantly reduces the risk of mortgage default from the owner of a Green Home compared to standard homes. In return, the bank reduces the monthly interest rate relative to similar products for standard homes due to the improved default risk and higher asset values of the Green Homes in the Green Mortgage portfolio of the bank.

**The “total monthly cost of ownership” of the home is, however, reduced as the monthly energy savings and lower mortgage interest rate offset the slightly larger loan required for the purchase of a Green Mortgage qualified**

While Green Homes require a new approach, they do not necessarily result in increased overall project costs. We can, however, consider an additional investment of 5 to 15% for construction costs as a potential premium for a home to reach the quality, operational cost reduction and environmental performance of a Green Home. The “total monthly cost of ownership” of the home is, however, reduced as the monthly energy savings and lower mortgage interest rate offset the slightly larger loan required for the purchase of a Green Mortgage qualified home. Any green construction cost premium largely contributes to the quality of the construction. This allows the investor/ developer to recoup any additional investment to maintain profit margins without increasing the monthly ownership cost to the home buyer facilitating the transaction.



CERTIFIED BY



ROMANIA  
GREEN  
BUILDING  
COUNCIL



**GREEN MORTGAGE  
APPROVED PROJECT**

The Green Homes certification is the indicator to partner banks that the residential project has been assessed upon completion and satisfies the necessary criteria to receive the financial benefits of a Green Mortgage.



Our program conducts workshops and creates an educational brochures in 11 languages for home buyers to be informed on the financial health and other benefits of borrowing responsibly to buy a green home.

# How does the Green Mortgage program work?

The Green Mortgage is delivered through a consortium between a participating bank, a real estate investor/developer agreeing to meet the program's criteria, a home buyer seeking the benefits of the program, and the Certifier who guides the process and evaluates the project upon completion.



**Luca Bertalot**  
Secretary General of the European Mortgage Federation

supporting Green Mortgage program and presenting at "Changing Finance, Financing Change" Workshop.



The Green Homes & Green Mortgage program is included as a Case Study in a green finance guide from the Energy Efficiency – Financial

Institutions Group established by the European Commission's DG Energy and the United Nations Environment Programme

## Identifying Partner Banks

The Certifier and prospective Partner Banks agree to jointly administer and promote the Green Mortgage program. The program is made available to all qualified banks offering home mortgages who agree to the required criteria. The Partner Bank will continue to be responsible for all financial due diligence associated with its normal underwriting process. The Partner Bank will agree to accept the Certifier's criteria and process of certification of that criteria being met as valid to determine residential projects qualified to receive the beneficial terms of a Green Mortgage. The Partner Bank also agrees to offer a substantive interest rate reduction commensurate with default risk reduction and enhanced long term asset value of Green Mortgage-qualified homes. This discount must be significant relative to the normal market offer and not offset by additional fees and be upheld throughout the life of the mortgage.

## Promoting Benefits for "Pre-Certified" Green Homes

The Investor/Developer agrees, at the beginning of the development process to create a residential development subject to the Green Homes Criteria and signs a "Pre-Certification Agreement" (see "How does the "Green Homes" program work?" section above). The investor/developer meets with the Certifier and Partner Bank(s) to discuss including the project in their Green Mortgage program. Upon these partners' agreement and an accepted and signed "Pre-Certification agreement", the developer/investor can begin to market their project as "Pre-Certified for Green Homes" and informing potential buyers they will have a special discount on financing

through the Green Mortgage program. It is the sole responsibility of the Investor/Developer to achieve all of the necessary criteria upon completion to enable issuance of the Green Mortgage product. All advertising of interest rates must conform to local law.

## Completion of Project, Certification and transacting Green Mortgage for Home Buyers

Upon analysis and successful achievement of a project as "Green Homes certified", the Certifier notifies the partner bank(s) that the project is eligible to receive the discounted terms of the bank's Green Mortgage product. The underwriting process is similar to the partner bank(s)'s standard procedure from this point forward.

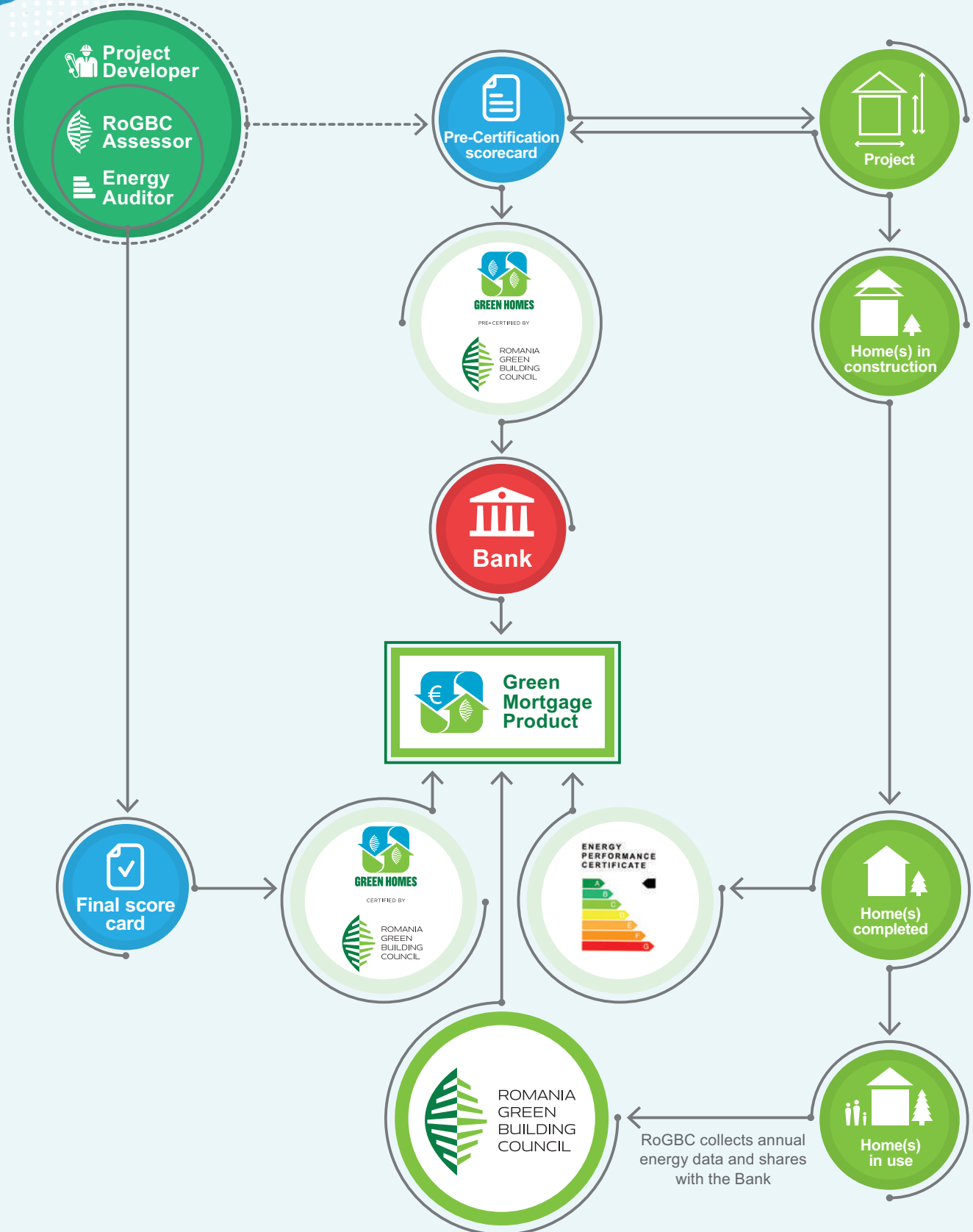
*NOTE: while the Green Mortgage terms are made available only upon the Certification after the project has been completed, Investors/Developers must confirm with the participating banks at the inception of the project that the bank(s) are willing to issue mortgages for the project and would extend the benefits of a Green Mortgage should the project qualify.*

## Monitoring of the Program

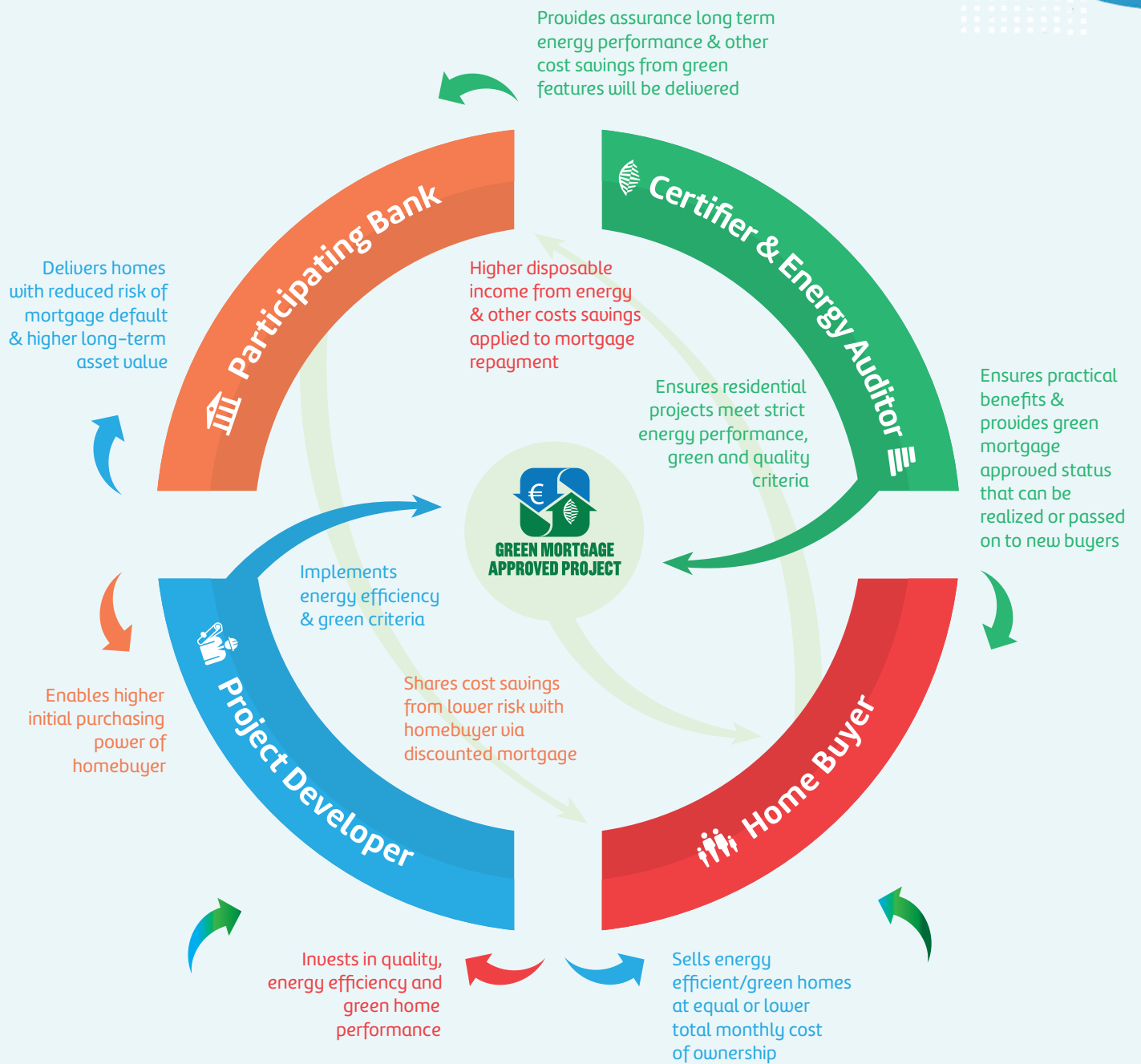
Borrowers benefiting from Green Mortgages will agree to supply annual energy and water usage data to the Certifier, confirm of the installation of energy efficient appliances post-occupancy, and be subject to retesting of indoor air quality and water quality.

This data will be shared with the participating banks to compare predicted versus actual green performance and to determine continued eligibility for a discounted mortgage. Additionally, the partner banks will share information on portfolio performance comparing their Green Mortgage to standard mortgage results.

# Green Mortgage Eligibility Process



# Responsibilities and benefits of Stakeholders of the Green Mortgage program



Delivers best-in-class Green Homes solutions to help Project Developers achieve the necessary energy efficiency and green homes performance to deliver to Home Buyers see <https://greenhomes.solutions/>.

# Other Benefits to Stakeholders

## General benefits of the project

- Elimination of the initial cost barrier for implementing energy efficient residential projects;
- Overcomes other market failures that seriously inhibit the construction of greener, more energy efficient homes including:
  - The “agency problem”: the different interests of the developer and buyer are aligned though bank financing;
  - The “information problem”: lack of understanding of some home buyers of the reduction in the overall life-cycle costs due to energy efficiency measures is overcome by the energy audit, green criteria, coaching through the process and bank financing;
- The “rationality problem”: people do not always act rationally in their economic interests when assessing short-term vs long-term benefit. Introducing a Green and Energy Efficiency component into financing brings a new incentive that transforms long-term benefits into short term (monthly) benefit; and
- Demonstrates a concept that can be replicated and scaled upward.

Certified Green Homes require due consideration of indoor air quality, elimination of toxic building materials including paints, other coatings, adhesives and flooring, superior and efficient lighting quality, and other attributes that ensure a more healthy, enjoyable and valuable home.

## What does the market think?



*We will fully support this effort including enrolling our latest project “Gelovani Project” into the “Green Homes & Green Mortgage programme” to certify its energy and green performance.*

*M2 creates new standards of quality and comfortable living in Georgia. We are in a constant search for innovative ideas which would elevate optimal design of residential areas and construction quality to new heights.*

**Irakli Burdildadze**  
CEO JSC M2 Real Estate



*In 2017, our organization took the first major step to promote energy efficient buildings by launching our Green Mortgage product. Considering the significant share of residential energy consumption, the widespread usage of green mortgages will contribute greatly to Turkey’s energy efficiency targets and its transition to a low-carbon economy.*

**Murat Atay**  
CEO Garanti BBVA Mortgage

## The project will also bring important benefits to all stakeholders

### For the investor/developer, this program provides

- Market differentiation as the Certified Green Homes program is the only significant, project-level indicator of quality, long-term cost savings, and green performance on the local market;
- Assurance of increased buying power of interested home-buyers; and
- Increased demand for a unique market offering and competitive advantage (as the home-buyer will not feel the burden of the increased initial costs that are covered by the loan).

### For the bank, this program provides

- Introduction of a new financial product with predictable costs and revenues allowing differentiation in a highly competitive banking market;
- Reduction of risk of mortgage default in the bank’s mortgage portfolio via the introduction of loans underwriting homes with lower energy and maintenance costs, and higher asset values;
- An effective program that aligns the banks’ social and environmental responsibility objectives with the types of preferred projects they choose to finance;
- Demonstration of the bank’s recognition of the higher value of green buildings in terms of income security, quality, and market value; and
- Contributes to significantly improving the environmental responsibility of the construction and real estate industry that also improves energy security and economic opportunities from a low carbon economy.

### For the home-buyer, the program provides

- Benefits from a higher-quality and energy efficient house with a net positive monthly financial benefit from energy savings and a discounted mortgage interest rate;
- The health attributes associated with Green Homes include reduced exposure to toxic materials (including carcinogens) and, for example, reduced incidence of asthma. Over the length of homeownership, this can provide significant financial benefit by lowering medical costs and reducing work days lost due to illness;
- A higher price in case of reselling the house due to a high “A” score on the Energy Performance Certificate, additional green criteria and the associated quality improvements.

# Assessing Renovation projects projects for eligibility for Green Finance products

**For renovation projects, where the scope of work is limited, green financial products, focus on**

1. Pre-approved lists of products, materials, technologies, and services that improve the green performance of a renovated property and
2. Additional products, materials, technologies, and services desired to be utilized by the Project Developer that must be evaluated by competent experts to determine if it is appropriate as a “green” solution.

The RoGBC process assumes the limited financial investment in renovation projects (as compared to full, new construction or “deep” renovation projects) requires a methodology to minimize green assessment costs as a percentage of total project costs. Therefore a process to include both an automated portal where pre-approved products can be selected by Project Developers and a separate process to assess solutions not yet pre-approved is utilized to efficiently and accurately ensure the desired green performance in a cost-effective manner.

### **Green Solution Selector Tool**

This Tool is a web portal with an easy to use interface that allows the Project Developer to quickly review eligible solutions for their project and to contact the solution provider for further information.

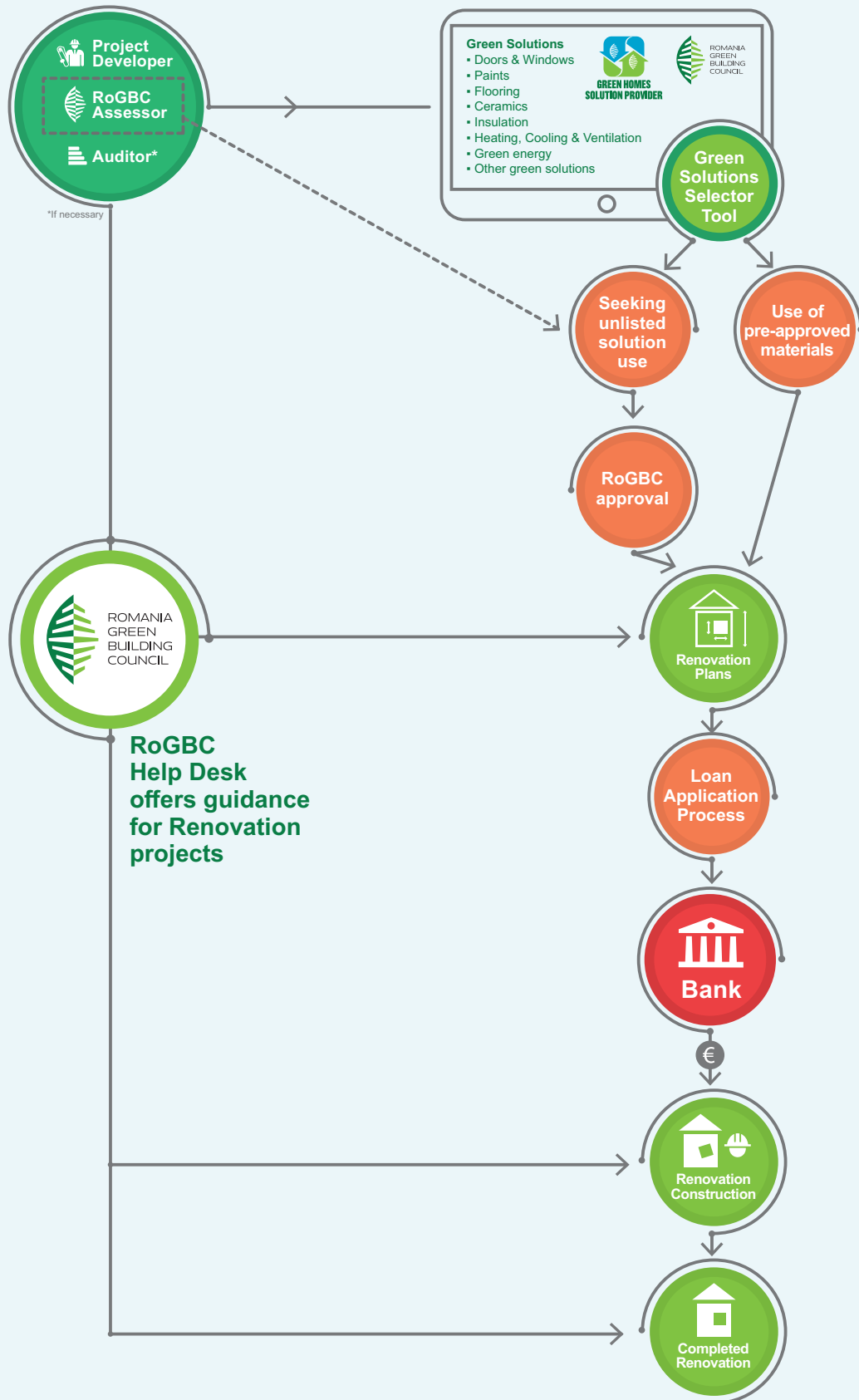
### **Request for Inclusion of an Unapproved Solution(s)**

While a sufficient list of approved solutions is intended to accommodate most renovation plans, Project Developers may desire to utilize other products, materials, technologies and services not yet approved for use as a “green” solution. RoGBC is prepared to quickly assess these ad hoc requests and issue appropriate guidance to the Project Developer and bank as to the eligibility of the solution.

For general project guidance, a RoGBC Green Homes Help Desk is available to help homeowners achieve their objectives for a high quality, green renovation.



# Green Renovation Loan Eligibility Process





# Risks & Mitigating Factors

## Lack of demand for housing, green or otherwise

This is related to the general state of the market and not the Green Mortgage program. A Green Homes certified project should, ceteris paribus, have a higher demand than regular buildings in every market situation; a fact demonstrated by strong sales of the first generation of green residential projects.

## Overestimation of the energy efficiency savings by the certified auditors

The Green Homes certification process is carefully constructed to ensure planned objectives deliver expected results. The energy auditor and the Certifier assessor must be engaged at the earliest possible moment to instruct the design team on likely outcomes of their decisions. This risk is also mitigated by choosing energy auditors for the project who share the goals of estimating and realizing energy savings rather than “checking the box” of an administrative task.

## Lower than expected performance of energy savings equipment and installations delivering less energy savings

The Green Homes program’s requirements to achieve a top energy score provide strong assurance that the building will perform to expectations. Critical components of green homes ranging from effective insulation and high efficiency Heating, Ventilating, and Air Conditioning (HVAC) equipment must function correctly to achieve the promised economic performance necessary to reduce mortgage default risk.

Solutions recommended for the program have been thoroughly researched, implemented elsewhere with clear results and, in the case of most systems, backed by manufacturers’ guarantees.

Furthermore, close participation of the solution providers contributing to the pilot projects ensures that issues will be resolved quickly. Lastly, the Green Mortgage requirements to share ongoing energy performance on other operational data will provide continuous feedback to the construction industry improving the required skills to introduce best-in-class green solutions.

## Falling energy prices

Despite persistent macroeconomic challenges, energy prices and energy scarcity are predicted to go substantially higher. An increasing willingness of the EU and local government to “price carbon” and tax inefficient behaviour greatly reduces the likelihood that the energy price to the end consumer will decrease. Dramatic technological advances in “green” energy might reduce long term prices but the widespread, positive economic benefits that would accompany this welcome scenario should clearly outweigh the smaller differential in expected financial savings from energy efficiency measures.

We have reached a critical point where the risk of “business as usual” with respect to financing new homes introduces significant future risk compared to instituting changes that improve the performance of the residential projects regarding energy use, resource use and construction quality. There is a significant opportunity to preempt the impending challenges by participating in a sensible and conservative approach to reducing risk in the housing market via greener construction approaches.

# About the Administrator of the Program

Building Council (RoGBC) is a non-profit, non-political association of the country's leading green building investors, solution providers and other important stakeholders endeavouring to deliver the market, educational, and legislative conditions necessary to promote high performance construction that is both environmentally-responsible and profitable. The RoGBC endeavours to create an exemplary development model for the region by ensuring the built environment will not imperil future generations but rather be a source of safety, health, comfort, innovation, and economic opportunity.

The organization promotes innovative financial tools for improving Romania's buildings

including the "RoGBC Green Mortgage" program, advocates for local and national policy to provide property tax incentives for green buildings, organizes exemplary green building demonstration projects, provides the multi-disciplinary Green Building Professional education program, holds numerous awareness-building events on a variety of sustainable construction topics, and creates a marketplace for green building solutions and projects.

The Board of Directors are elected each year by the RoGBC membership and represent leaders in the green construction and real estate industries. More information is available at [RoGBC.org](http://RoGBC.org)

## Authors and Researchers for the Green Homes certified by RoGBC and Green Mortgage program

### STEVEN BORNCAMP

**Lead author of the RoGBC Green Homes & Green Mortgage program**

Mr. Borncamp initiated the Green Mortgage concept prior to the founding of RoGBC then contributed the rights to the organization on the condition it be made available on an "open-source" basis to assist financial institutions to introducing ambitious green building material into their decisions and pricing relating to mortgage financing. He is the lead author of the Green Homes certified by RoGBC and Green Mortgage toolkit and is supported by the Romania Green Building Council team and external experts engaged as contributors.

### Lec. Dr. eng CRISTIANA CROITORU

**Civil Engineer, energy efficiency, indoor environmental quality and sustainable building design expert, and a researcher at the Technical University of Civil Engineering in Bucharest.**

Dr. Croitoru contributed Net Zero Energy Building (nZEB), Indoor Air Quality, and Energy Audit expertise. In addition she contributed building performance knowledge related to the financial modeling of sample Green Homes projects and provided input into the criteria of the Green Homes aspiring housing projects.

### MONICA ARDELEANU Ph.D.

**Executive Director & Research Director of RoGBC**

Dr. Ardeleanu provided research assistance and quality control for the RoGBC Green Mortgage toolkit set of documentation. She has worked with the building community to identify partner companies for both the pilot stage and future expansion of the program.

### ELENA RASTEI

**Building sustainability expert, member of the board, RoGBC**

Ms. Rastei is the lead developer for the original and current set of criteria for the assessment of Green Homes-aspiring housing projects. She chairs RoGBC's Certification & Education Task Groups and is responsible for the continuous evolution of the Green Mortgage program's criteria. Ms. Rastei led a group of 30 multi-disciplinary building experts to review the Certification criteria.



Romania Green Building Council will host their 9th annual national green building awards. By selection of an expert jury, the annual event recognizes top achievement in the country by project teams, companies, government and educational institutions.



## Specialists who contributed mentioned in alphabetical order

Eng. Dorin Beu Ph.D | Reader Technical University of Cluj-Napoca | Manager of Lighting Engineering Laboratory | President of Romanian National Lighting Committee.

Andrei Botis | Member, Royal Institute of Chartered Surveyors) | CEO NAI Romania & Moldova

Eng. Sebastiano Cristoforetti Ph.D | Managing Director at CRISCON | Member of the Policy Task Force of the European Regional Network of the World Green Building Council

Alexandra Cucos (Dinu) Ph.D | Head of Radon Laboratory „Constantin Cosma”-LiRaCC at Babes-Bolyai University. Babes-Bolyai University Babeş-Bolyai University

Lec. Ing. Angel Dogeanu Ph.D. | BREEAM AP | Energy Auditor

Eng. Eugen Goldhammer | Energy Auditor | Thermography Specialist Grade 1 | ISO14001| EGEEA Design SRL

Arh. Doru Hendea | Head Arhitect | Sustainability Consultant | Ecoproiect

Biolog Oriana Irimia Ph.D | Climate Change Programs Coordinator, Zero Waste România

Eng. Călin Jantă, PM | Construction Site Management, Ausbau

Eng. Alexandru Mocanu | Project Manager Consultant at Sentient | LEED

Eng. Ștefan Munteanu | Auditor Energetic & Consultant Conformare Energetica la Standard de Casa Pasiva/NZEB/AZEB/Green Homes | SC CIVILIS SRL

Sinziana (Frangeti) Pardhan | Managing Director Romania at P3 Logistic Parks

Eng.Horia Petran Ph.D. | Institutul Național de Cercetare-Dezvoltare în Construcții, Urbanism și Dezvoltare Teritorială Durabilă „URBAN-INCERC”

Eng. Dragoș Rîți | Head of Construction Services Erste Group Immorent | Managing Director Premium Tech Team PTT

Eng. Cătălin Sima Ph.D. | Commissioning Specialist, Green Building Consulting

Eng. Laurențiu Tăcutu Ph.D. | Qualified Acoustics Technician

Arh. Serban Tiganas Ph.D | Secretar General, Uniunea Internațională a Arhitecților (UIA)

### RoGBC support team:

Arh. Teodora Albu

Arh. Anca Bolohan

Arh. Isabela Manu

Gabriela Mindru

Eng. Mihaela Nicolau

## International Leadership of the SMARTER Finance for Families initiative

Steven Borncamp  
SMARTER Finance for Families  
Project Director

Johanna Varghese  
Irish Green Building Council  
Communications & Awareness Building

Camilo Paez  
Université Libre de Bruxelles  
Research & Data Structuring

Iva Svobodová  
People In Need  
Green Mortgage / Green Renovation Loans  
Solutions for Energy Poverty Mitigation

Merete Villum Pedersen  
Copenhagen Centre on Energy Efficiency,  
Danish Technical University  
Quality Assurance & Increasing Institutional  
Financing

Aristeidis Tsakiris  
Copenhagen Centre on Energy Efficiency,  
Danish Technical University  
Knowledge Management System

John Fingleton  
Irish Green Building Council  
Alignment with CEN Standards

Daniel Butucel / Je ffColley  
GreenHomes.Solutions

Duygu Erten Ph.D.  
dott. Eng. Sebastiano Cristoforetti  
Level(s) Guidance and Implementation

# Frequently asked questions

## What are the first steps for a residential investor/developer interested in qualifying their project for a Green Mortgage program?

It is important to contact the Certifier at the earliest possible point of the development process. Given the importance of site location, it makes sense to fully understand a green approach in establishing the location of your project before purchasing land. The "Pre-Certification review" determines if it is feasible to expect certification as a Green Home subject to the planned approach of the investor/developer. The "Pre-Certification provides guidance about the necessary steps to achieve certification.

## What has prevented Green Mortgages from appearing until now?

Loans that reward investments in energy efficiency have existed for a number of years globally but most were focused on renovation and specific items (e.g. windows, HVAC, insulation) rather than a holistic approach necessary for a truly high performance, green home. In addition, cost effective and credible methods to assess the homes green performance did not exist in most markets; something the Green Homes certification now addresses. In recent years, financial institutions have begun to create and implement "Energy Efficient Mortgages" (or EEMs) with the most active programs being seen in the United States where the Environmental Protection Administration's "Energy Star" program for homes was used to qualify projects. Further progress has been seen with government-sponsored entities such as the Federal National Mortgage Association (commonly known as "Fannie Mae") that purchase mortgages from lending banks encouraging incentives for these mortgages.

Conclusive evidence demonstrates strong correlation between energy efficient homes and a reduction in mortgage default risk relative to standard home which is similar in all aspects. We will see far more consideration of green homes and green mortgages by financial institutions over time given they exhibit stronger value over time attributable to higher quality materials and superior design, lower operating cost profile as well as stronger appeal based on characteristics such as favorable air quality, natural light and acoustic conditions.

over time indicates we will see far more weight from financial institutions on the energy and green performance of the home for which they underwrite given these characteristics which makes them more desirable to originate and hold in a portfolio given favorable valuation and risk-adjusted return dynamics given these characteristics which makes them more desirable to originate and hold in a portfolio given favorable valuation and risk-adjusted return dynamics.

Furthermore, the European Commission's DG Energy supported "Energy Efficiency Financial Institutions Group" (see EFIG.eu) that has been actively exploring methods to remove barriers to long-term energy efficiency finance. This Green Homes and Green Mortgage program is now included as a Case Study in the EFIG underwriting guide for financial intuitions on green finance.

## How is the integrity of the Green Homes assessment process assured?

The mission of the program is to ensure the transformation of the construction and real estate industry toward greater environmental responsibility. To accomplish this, creating and administering a credible and effective process to assess and reward only qualified projects for inclusion in incentive programs is of paramount importance. The Pre Certification Agreement established both the criteria and a clear indication of how successful achievement of the criteria must be achieved. Representatives of partner banks offering Green Mortgages based on the certification are invited to participate in the certification process to see firsthand how information is verified.

Furthermore, with continued expansion of the program, the will, with input and governance from partner banks, establish a separate legal organization with revenue derived only from certification activity to administer the Green Homes certification process.

## Is the Green Homes certification the only way to be eligible for a Green Mortgage?

The program administrators believe their Green Homes certification program is the most cost effective and relevant method to assess green performance and resulting beneficial ongoing financial profile of homes. The Certifier does not, however, want to create undue administrative burdens or costs on residential investors/developers who may wish to pursue another recognized green home certification. Therefore, with prior consultation with the Certifier and partner banks of the Green Mortgage program, a project can be qualified or significantly reduced costs by recognizing other certification systems. For example, a developer/investor chooses to pursue LEED for Homes certification of the project. The Certifier believes LEED "Gold" is a sufficient level of achievement to be qualified for a Green Mortgage. The Pre-Certification agreement between the investor, partner banks and the Certifier would specify that the developer achieve LEED "Gold" certification, accomplish a reduced list of green criteria not covered by LEED. The Certifier and the investor would also agree upon a significantly reduced fee – 10 to 20% of the standard certification fee plus travel costs if any, for example – to perform a one time, local assessment of the project to provide assurance to the participating banks of conformity to the Green Mortgage program goals.

# References cited in this Toolkit

<sup>1</sup> Roberto Quercia, Robert Sahadi, Sarah Stellberg, Home Energy Efficiency and Mortgage Risks (Chapel Hill, NC, Center for Community Capital, UNC & Washington, D.C., IMT Institute for Market Transformation, March, 2013)

The Green Mortgage program criteria require a higher level of energy efficiency improvements relative to standard than the “Energy Star” homes used in this research. These facts indicate we could expect equal or greater relative reductions in energy costs from applying green home criteria and thus similar or greater relative reductions in mortgage default risk.

The Energy Star homes used in this research must achieve energy efficient performance greater than 15% of the International Energy Conservation Code although many achieve savings of 20 to 30%. Furthermore, the green building principles

and approaches rewarded by Energy Star are included in Green Mortgage criteria; each having a strong, positive impact on building quality and reduced energy costs. The program also includes a greater focus on avoiding toxicity in building materials choices which does not impact (or does so minimally) on costs for the whole project.

<sup>2</sup> Gary Pivo, The Effect of Sustainability on Mortgage Default Prediction and Risk in Multifamily Rental Housing (San Diego, Ca, Journal of Sustainable Real Estate Volume 5, Number 1, 2013)

<sup>3</sup> Appraisal Institute news, Appraisal Institute Supports USGBC’s ‘Green’ Home Report Findings (Chicago, IL, Appraisal Institute, 2014)

<sup>4</sup> LEED in Motion: Residential Report (Washington, D.C., U.S. Green Building Council, 2014 + 2019)

<sup>5</sup> European Commission report, Energy prices and costs in Europe Report (Brussels, European Commission, 2019)

Weighted importance of household energy products on household budgets was extracted from statistics provided by Eurostat. “The Harmonised Index of Consumer Prices (HICP) is an indicator used for monetary policy decisions and is calculated in each Member State using a common methodology.” “The assigned weight represents the importance of goods and services in a country’s consumption structure.” Paying energy bills rank high on financial priorities of households as the energy companies have effective means of ensuring paying by stopping the supply of essential energy.

## Additional references reviewed

Colin Neagle, Energy Efficiency Linked to Mortgage Default Risk: Will Lenders Take Note? (Berkeley, Ca, Energy Technologies Area, Berkeley Lab, 2018)

“Investors are increasingly expecting access to buildings’ sustainability data, while research has shown that tenants may be willing to spend more for space in buildings that show energy efficiency certification. The possibility that lenders may factor energy efficiency into their decision-making is just the latest sign that a strategic approach to energy management is becoming a competitive advantage.”

BuildUP Portal Editorial Board, Financing Energy Efficiency in Buildings Overview Article (Brussels, Buildup.eu, 2019)

Green Mortgages: “The principle is that all stakeholders derive a concrete benefit since lower capital requirements will deliver a strong incentive for banks to enter the market and, as a result, drive a broader incentive chain, in which all stakeholders, including EU citizens, issuers, investors, and society as a whole will benefit”

Stephen Richardson, What are green mortgages & how will they revolutionise home energy efficiency? (London, World GBC, 2017)

“A green mortgage offers a way of unlocking additional finance for renovation from the private sector, bringing a whole new group of stakeholders into the campaign for green buildings - mortgage banks... It also puts the topic of energy efficiency and sustainability front of mind for the building owner at an important stage in the building’s life, when typically, decisions about property renovations may be made.”

Core Concepts - International Performance Measurement and Verification Protocol IPMVP (Washington, D.C., Efficiency Valuation Organization www.evo-world.org, 2016)

Nikhil Kaza, Roberto Quercia, Robert Sahadi, Home Energy Efficiency and Mortgage Risks: An Extended Abstract (San Francisco, Ca, Community Development Investment Review, issue 01, 063-069, 2014)

Including the debt-to-income ratio and utilizing energy audits as part of the mortgage underwriting process would help homeowners make informed decisions

about energy efficiency investments and likely promote long-term efficiency of the house”.

Sandra K. Adomatis, Residential Green Valuation Tools (Chicago, IL, Appraisal Institute, 2014)

Julia J. Mundo-Hernández, Julia Hernández-Alvarez, Cristina Valerdi-Nochebuena, Jorge Sosa-Oliverulia Designing Sustainable and Healthy Homes (European Scientific Journal, vol.10, no.20. July 2014)

Lisa B. Ryan (UC Dublin), Mobilising investment in energy efficiency: Economic Instruments for low-energy buildings (Paris, IEA International Energy Agency, 2012)

Xavier Bonnefoy, Inadequate housing and health: an overview (Geneva, International Journal of Environment and Pollution, 30 (3-4), p.411-429, 2007)

# Appendix 1: Multi-Family

## Example of assessment criteria for Green Homes certified projects: New Construction & Major Refurbishment, Renovation & Retrofits

		18	ENVIRONMENTAL LEADERSHIP
A1	Integrated Design	Required	To optimise the design and construction process, increase environmental performance, and reduce costs by including a wider array of expertise early in the design process. The team members who must be involved in the beginning of the design phase include architects, engineers, green building consultant and/or bio-climatic design specialist (depending on the existing green expertise of the design team), energy modelling, landscape architecture, habitat restoration, and land-use planning experts. A RoGBC advisor will be available as part of the Green Homes certification agreement to help facilitate meetings and design charrettes to ensure optimal project approaches.
A1.1	Education for the Design Team	2	The RoGBC team will conduct workshops for the design team to explain the certification process and green building principles. The design team members will be required to attend a minimum of 3 courses within the Green Building Professional education platform. The cost of these courses is included in the Green Homes certification agreement.
A2	Life Cycle Assessment	Required	To create benchmarks, to identify and use construction materials with a low environmental impact, including embodied carbon, over the full life cycle of the building. The analyses will be performed by the RoGBC specialist.
A2.1	Life Cycle Assessment	1	To create benchmarks, to identify and use construction materials with a low environmental impact, including embodied carbon, over the full life cycle of the building. The analyses will be performed by the RoGBC specialist.
A3	Construction Waste Management Planning	3	To divert from landfills and incinerators the waste generated from construction or renovation/ refurbishment. The diversion can be achieved by implementing waste prevention measures and strategies, reuse on site, or sorting for recycling.
A4	Responsible Construction Practices	3	To reduce pollution and disruption caused by construction activities and to recognise and encourage an environmentally and socially responsible approach to construction site management.
A5	Operational Waste Management	Required	Above the legislation requirement and in line with the zero waste sorting criteria.  1. (Required) To include within the design and construction stage a system for the homeowners to sort inside their home by at least three main categories, including: recyclables, biodegradable, and residual waste. Recyclable materials must include mixed paper, corrugated cardboard, glass, plastics, and metals. 2. (Required) A special outside area must be dedicated to the safe collection, storage, and disposal of the following: batteries, mercury-containing lamps, and electronic waste.
A5.1	Operational Waste Management - BIOWASTE	3	3. If the above has been achieved, additional points can be earned for including a composting area or compost tumbler for yard clippings and kitchen food waste. The owners/tenants shall be provided with composting instructions in the manual referenced in section B2: Education for Homeowner / Ensuring Green Performance.
A6	Commissioning for Supply and Return Air Flow Testing, Mechanical Ventilation Testing and Low Leakage	2	To improve construction quality and post-occupancy building performance by eliminating potential installation flaws and optimizing the installed systems. The process includes verifying all of the subsystems for mechanical (HVAC), plumbing, and electrical to achieve the owner's project requirements and green performance as intended by the building owner and design team.
A6.1	Commissioning for Supply and Return Air Flow Testing, Mechanical Ventilation Testing and Low Leakage	4	The process includes verifying the envelope performance.
		25	SITE & LOCATION
B1	Transparency and Information Sharing	Required	To establish a green building performance monitoring, financial benchmarking and to help improve the certification criteria for the future. Homeowners or tenants will share energy and water usage data with RoGBC on an anonymous basis.
B1.1	Transparency and Information Sharing	1	To establish a green building performance monitoring, financial benchmarking and to help improve the certification criteria for the future. Homeowners or tenants will share energy and water usage data with RoGBC on an anonymous basis.
B2	Education for Homeowner / Ensuring Green Performance	Required	A manual must be created and provided to all new homeowners that inform and educate them about proper operation of the home in a green and cost-effective manner. This includes ensuring understanding of building systems, household waste management and non-toxic cleaning methods.
		18	WATER EFFICIENCY
D1	Water Metering	Required	To support water efficiency efforts by monitoring and benchmarking water use over time.
D2	Water Efficient Fixtures	5	To reduce total indoor and outdoor water consumption, thus contributing to a more efficient sustainable water operation activity.



D3	Fully Operational Greywater System	6	To reduce the water consumption by collecting and reusing greywater from the site.
D4	Water Efficient Landscaping	7	To utilize strategies to minimize or eliminate water usage, reduce maintenance costs while providing enjoyable landscaped areas.
		<b>36</b>	<b>MATERIALS &amp; RESOURCES</b>
E1	Natural Materials	5	To encourage the use of lower environmental impact and alternative solutions for masonry and insulation.
E2	Reclaimed Materials	5	To encourage the use of reclaimed materials (salvaged, refurbished or reused).
E3	Local/Regional Cladding Materials	4	To encourage the use of the local production and to use products that were extracted, processed or manufactured locally.
E4	Recycled Content	3	To encourage the use of recycled content materials.
E5	Environmentally Responsible Sources	Required	To encourage selection of products that have been extracted or sourced in a responsible manner.
E5.1	Environmentally Responsible Sources	3	Use of minimum 10 products with Environmental Product Declarations (EPDs) and/or sustainability certifications recognized at European/International level such as Cradle to Cradle, Ecolabel etc, FSC, etc.. For the purpose of this requirement, one EPD per category will be considered. Categories: - Wood (permanently installed in the building, eg: doors, floating floor, OSB) - Concrete and / or cement - Steel - Stone and / or aggregates - Materials made of clay - Cardboard bottle - Glass - Plastics, polymers, resins, paint, other chemicals, bituminous - Fiber of animal origin, leather, cellulose fibers - Insulation
E5.2	Environmentally Responsible Sources	2	To encourage selection of products that have been extracted or sourced in a responsible manner.
E6	Low volatile organic compounds (VOC)	6	To reduce the health risk of the residents by using low (up to 10 grams per liter VOC) or no VOC by reducing concentrations of chemical contaminants that can damage air quality, human health, productivity, and the environment.
E7	Fire resistant materials	5	To increase fire safety by using insulation materials that are fire resistant within the A1 and B category according to the Romanian legislation.
E8	Renewable materials	3	To decrease dependence of non-renewable materials by using at least 30% in volume of renewables and rapidly renewables such as bamboo wood, cork, cotton (recycled denim), agrifiber, natural linoleum, etc. from the total amount of materials used on site.
		<b>12</b>	<b>HUMAN HEALTH &amp; WELLNESS</b>
F1	No smoking in the common areas	Required	To prevent or minimize exposure of building occupants to tobacco smoke. Prohibiting smoking in all common areas of the building.
F2	Radon safety	Required	To prevent or minimize exposure of building occupants to indoor radon concentration. Monitoring, controlling and reducing indoor radon exposure in all occupied areas of buildings
F3	Formaldehyde, VOC, & Particulate testing air testing before home occupancy	Required	To encourage superior interior air quality measures are implemented.
F4	Acoustic comfort	3	Calculations provided by the architect and confirmation the acousting indicativ C 125/1 - 2013 a Normativului privind acustica în construcții și zone urbane, indicativ C125-2013 was considered. (The norm on acoustics in constructions and urban areas, indicatives)
F5	Biophilic Design	5	To alleviate stress and anxiety while improve the indoor environment and air quality.
F6	Urban Farming/ Food Production	4	To improve food security, support a local economy, and contribute to social inclusion, Urban Farming and Food Production is encouraged. This is synergistic with credit A 3: Operational Waste Management and with C4: Heat Island Effect Reduction. It contributes to the greenery of the city along with efficient use of urban waste.
			<b>ENERGY OPTIMISATION</b>
G1	To reduce excessive energy use, shift toward low carbon energysolutions, improve energy security, and reduce energy costs.	Required 20 30 40	improvement in Kwh/sqm/year energy performance compared to the minimum score for achieving an "A" class label in the Romanian Energy Performance Certificate (EPC) and comply to NZEB performance requirements 45% improvement per above 60% improvement per above PASSIVEHAUS Standard
		<b>10</b>	<b>INNOVATION</b>
H1	Innovative Ideas & Solutions	10	Ideas or Solutions to improve the green performance of the project can be submitted for consideration of awarding of up to 10 points.
<b>TOTAL POSSIBLE POINTS</b>		<b>160</b>	

Certified **80-99**

Excellent **100-129**

Superior **130-160**



# Appendix 2: Single-Family

## Example of assessment criteria for Green Homes certified projects: New Construction & Major Refurbishment, Renovation & Retrofits

		18	ENVIRONMENTAL LEADERSHIP
A1	Integrated Design	Required	To optimise the design and construction process, increase environmental performance, and reduce costs by including a wider array of expertise early in the design process. The team members who must be involved in the beginning of the design phase include architects, engineers, green building consultants and/or bio-climatic design specialists (depending on the existing green expertise of the design team), energy modelling, landscape architecture, habitat restoration, and land-use planning experts. A RoGBC advisor will be available as part of the Green Homes certification agreement to help facilitate meetings and design charrettes to ensure optimal project approaches.
A1.1	Education for the Design Team	2	The RoGBC team will conduct workshops for the design team to explain the certification process and green building principles. The design team members will be required to attend a minimum of 3 courses within the Green Building Professional education platform. The cost of these courses is included in the Green Homes certification agreement.
A2	Life Cycle Assessment	Required	To create benchmarks, to identify and use construction materials with a low environmental impact, including embodied carbon, over the full life cycle of the building. The analyses will be performed by the RoGBC specialist.
A2.1	Life Cycle Assessment	2	To create benchmarks, to identify and use construction materials with a low environmental impact, including embodied carbon, over the full life cycle of the building. The analyses will be performed by the RoGBC specialist.
A3	Construction Waste Management Planning	3	To divert from landfills and incinerators the waste generated from construction or renovation/ refurbishment. The diversion can be achieved by implementing waste prevention measures and strategies, reuse on site, or sorting for recycling.
A4	Responsible Construction Practices	3	To reduce pollution and disruption caused by construction activities and to recognise and encourage an environmentally and socially responsible approach to construction site management.
A5	Operational Waste Management	Required	To encourage resource efficiency and pollution prevention due to the waste generated by the building occupants.
A5.1	Operational Waste Management - BIOWASTE	2	Improvement of the existing developed site compared with its initial status.
A6	Commissioning for Supply and Return Air Flow Testing, Mechanical Ventilation Testing and Low Leakage	2	To improve construction quality and post-occupancy building performance by eliminating potential installation flaws and optimizing the installed systems. The process includes verifying all of the subsystems for mechanical (HVAC), plumbing, and electrical to achieve the owner's project requirements and green performance as intended by the building owner and design team
A6.1	Commissioning for Supply and Return Air Flow Testing, Mechanical Ventilation Testing and Low Leakage	4	The process includes verifying the envelope performance.
<b>ONGOING PERFORMANCE</b>			
B1	Transparency and Information Sharing	Required	To establish a green building performance monitoring, financial benchmarking and to help improve the certification criteria or the future, homeowners or tenants will share energy and water usage data with RoGBC on an anonymous basis.
B1.1	Transparency and Information Sharing	1	To establish a green home performance monitoring, financial benchmarking and to help improve the certification criteria for the future. Homeowners or tenants will share energy and water usage data with RoGBC on an anonymous basis.
B2	Education for Homeowner / Ensuring Green Performance	Required	A manual must be created and provided to all new homeowners that inform and educate them about proper operation of the home in a green and cost-effective manner.
		25	SITE & LOCATION
C1	Sustainable Site	Required	Development in National Parks and sensitive areas such as parkland, floodplain, wetlands, and water bodies is strictly forbidden.
C2	Site Ecology and Biodiversity	6	Improvement of the existing development site compared with its initial status.
C3	Heat Island Effect Reduction	3	To diminish the heat absorbed by both roof and non-roof structures, to improve energy efficiency and outdoor habitat for humans and wildlife via vegetative or cool roofs, green walls, high Solar Reflectance Index (SRI) pavements, etc.
C4	Rainwater Management	2	To reduce the rainwater run off from the existing site by collection and possibly reuse of it for the existing landscape.
C5	Reduced Light Pollution	1	To reduce the energy consumption associated with the exterior lighting and reduce nighttime light pollution; to increase the visible night sky access and to improve nighttime visibility.
C6	Access to Amenities	5	Easy access to amenities such as Parks, Shopping, Houses of Worship, Fitness Centers, Banks and ATMs, Market stores, Schools, etc. To reduce traffic, fossil fuel use, and air pollution.
C7	Alternative Transportation	6	To encourage green transport choices by locating the project near public transportation and through the installation of bike lockers or racks, and close proximity to electric charging stations, pedestrian accessibility, car sharing parking spaces, and community transportation.
		18	WATER EFFICIENCY
D1	Water Metering	Required	The house is equipped with an individual water meter.
D2	Water Efficient Fixtures	5	To reduce total indoor and outdoor water consumption, thus contributing to a more efficient sustainable water operation activity.
D3	Fully Operational Greywater System	7	To reduce the water consumption by collecting and reusing greywater from the site.
D4	Water Efficient Landscaping	7	To utilize strategies to minimize or eliminate water usage, and reduce maintenance costs while providing enjoyable landscaped areas.



		<b>36</b>	<b>MATERIALS &amp; RESOURCES</b>
E1	Natural Materials	<b>5</b>	To encourage the use of lower environmental impact and alternative solutions for masonry and insulation.
E2	Reclaimed Materials	<b>6</b>	To encourage the use of reclaimed material (salvaged, refurbished or reused).
E3	Local/Regional Cladding Materials	<b>4</b>	To encourage the use of the local production and to use products that were extracted, processed or manufactured locally.
E4	Recycled Content	<b>3</b>	To encourage the use of recycled content materials.
E5	Environmentally Responsible Sources	<b>Required</b>	To encourage selection of products that have been extracted or sourced in a responsible manner.
E5.1	Environmentally Responsible Sources	<b>3</b>	Use of minimum 10 products with Environmental Product Declarations (EPDs) and/or sustainability certifications recognized at European/International level such as Cradle to Cradle, Ecolabel etc, FSC, etc.. For the purpose of this requirement, one EPD per category will be considered. Categories: - Wood (permanently installed in the building, eg: doors, floating floor, OSB) - Concrete and / or cement - Steel - Stone and / or aggregates - Materials made of clay - Cardboard bottle - Glass - Plastics, polymers, resins, paint, other chemicals, bituminous - Fiber of animal origin, leather, cellulose fibers - Insulation
E5.2	Environmentally Responsible Sources	<b>2</b>	To encourage selection of products that have been extracted or sourced in a responsible manner.
E6	Low volatile Organic Compounds (VOC)	<b>6</b>	To reduce the health risk of the residents by using low (up to 10 grams per liter VOC) or no VOC by reducing concentrations of chemical contaminants that can damage air quality, human health, productivity, and the environment.
E7	Fire Resistant Materials	<b>5</b>	To increase fire safety by using insulation materials that are fire resistant within the A1 and B category according to the Romanian legislation.
E8	Renewable Materials	<b>3</b>	To decrease dependence of non-renewable materials by using at least 30% in volume of renewables and rapidly renewables such as bamboo wood, cork, cotton (recycled denim), agrifiber, natural linoleum, etc. from the total amount of materials used on site.
		<b>12</b>	<b>HUMAN HEALTH &amp; WELLNESS</b>
F1	Radon Safety	<b>Required</b>	To prevent or minimize exposure of building occupants to indoor radon concentration. Monitoring, controlling and reducing indoor radon exposure in all occupied areas of buildings.
F2	Formaldehyde, VOC, & Particulate Testing Air Testing Before Bome Occupancy	<b>Required</b>	To encourage superior interior air quality measures implemented.
F3	Acoustic Comfort	<b>3</b>	Calculations provided by the architect and confirmation the acousting indicativ C 125/1 - 2013 a Normativului privind acustica în construcții și zone urbane, indicativ C125-2013 was considered. (The norm on acoustics in constructions and urban areas, indicatives)
F4	Biophillic Design	<b>5</b>	To alleviate stress and anxiety while improving the indoor environment and air quality.
F5	Urban Farming/ Food Production/ Permaculture	<b>4</b>	To improve food security, support a local economy, and contribute to social inclusion, Urban Farming and Food Production is encouraged. This is synergistic with credit A 3: Operational Waste Management and with C4: Heat Island Effect Reduction. It contributes to the greenery of the city along with efficient use of urban waste.
			<b>ENERGY OPTIMISATION</b>
G1	To reduce excessive energy use, shift toward low carbon energysolutions, improve energy security, and reduce energy costs.	<b>Required</b>	Improvement in Kwh/sqm/year energy performance compared to the minimum score for achieving an "A" class label in the Romanian Energy Performance Certificate (EPC) and comply to NZEB performance requirements
		<b>20</b>	45% improvement per above
		<b>30</b>	<b>60% improvement per above</b>
		<b>40</b>	PASSIVEHAUS Standard
		<b>10</b>	<b>INNOVATION</b>
H1	Various Ideas & Solutions	<b>10</b>	Ideas or Solutions to improve the green performance of the project can be submitted for consideration of awarding of up to 10 points.
<b>TOTAL POSSIBLE POINTS</b>		<b>160</b>	

Certified **80-99**

Excellent **100-129**

Superior **130-160**

# Appendix 3

## Financial example for Green Mortgages

The annual savings of a Green Homes certified apartment can equal 1 and 1/2 mortgage payments or more!

This case study from Romania compares an average “new build” project (represented by the “B” Energy Performance Certificate score) versus a “low A” and a Green Mortgage qualified project. The various components of the energy performance of the home are quantified. A “total monthly cost of ownership” is calculated to compare the financial impact of the owner of each residential units. This model makes conservative assumptions omitting, for example, the likely reduced repair costs of a green home versus a standard home.

While the construction costs and energy prices may differ in each country, a similar financial example prepared for other countries would demonstrate the benefits of investing early in green performance to reduce the “Total Cost of Monthly Ownership”

	EPC “B” rated apartment	EPC “A” rated apartment	Green Homes certified apartment
<b>NET SAVINGS WITH GREEN MORTGAGES (in Euros)</b>			
Sales price of 70 sqm apartment with Value Added Tax	98,000	100,100	104,300
Loan amount with 15% down payment	83,300	85,085	88,655
Monthly mortgage payment	499	510	505
Cost of energy/apartment/month (€)	101	65	33
<b>TOTAL COST OF MONTHLY OWNERSHIP: MORTGAGE + ENERGY</b>	<b>600</b>	<b>575</b>	<b>538</b>
Net monthly savings for certified Green Homes versus “B” apartment	0	25	62
Net annual savings for certified Green Homes versus “B” apartment	0	300	744

\* Assumptions: Market price: €1,400/sqm; Payment period: 25 years;

The developers will pass on the cost of the energy efficiency improvements directly to the consumers but will not add a profit on it.

### COSTS AND SAVINGS OF ENERGY EFFICIENT MEASURES

#### Construction parameters

Increase in construction cost from green measures (%)	0%	5%	15%
Construction cost (€/sqm)	600	630	690
Additional construction cost from green measures (€/sqm)	0	30	90
Total additional construction cost from green measures for home (€)	0	2,100	6,300

#### Energy consumption

Energy consumption for heating (kWh/sqm/year)	117	70	50
Energy consumption for domestic hot water (kWh/sqm/year)	35	15	15
Energy consumption for air conditioning (Cooling) (kWh/sqm/year)	35	20	10
Energy consumption for ventilation (kWh/sqm/year)	10	5	5
Energy consumption for lighting (kWh/sqm/year)	49	40	10
Total energy consumption for apartment (kWh/sqm/year)	246	150	90

#### Cost of energy

Average price of electricity (€/kWh incl. VAT)	0.12	0.12	0.12
Average price of gas (€/kWh incl. VAT)	0.04	0.04	0.04
Annual cost for heating energy(€/sqm/year)	4.89	2.93	2.09
Annual cost for domestic hot water (€/sqm/year)	1.46	0.63	0.63
Annual cost with airconditioning (cooling ) (€/sqm/year)	4.11	2.35	1.17
Annual cost for ventilation (€/sqm/year)	1.17	0.59	0.59
Annual cost for lighting (€/sqm/year)	5.75	4.70	1.17
Total annual cost of energy (€/sqm/year)	17.40	11.19	5.65
Total annual cost of energy for 70 sqm apartment (€)	1,217.72	783.18	395.79
Average monthly cost of energy for 70 sqm apartment (€)	101.48	65.27	32.98

#### Energy cost reductions

Average monthly energy savings relative to “B” apartment	0.00	36.21	68.49
--	------	-------	-------

### MORTGAGE RATE CALCULATION

Size of apartment (sqm)	70	70	70
Price of apartment	98,000	100,100	104,300
Percent of down payment	15%	15%	15%
Down payment	14,700	15,015	15,645
Interest rate (7 year fixed; local currency)	5.25%	5.25%	4.75%
Repayment period (years)	25	25	25
Loan amount	83,300	85,085	88,655
Yearly mortgage payment	5,988	6,120	6,060
Monthly mortgage payment	499	510	505

# Appendix 4

## Selection of certified green residential projects for the SMARTER Finance for Families consortium



### **Passive House at Wayside Cork, Ireland**

This single dwelling completed in 2016 is outstanding from both low energy and ecological points of view. It was designed to meet the Passive House standard criteria, it has extremely low heating bills and a monitoring systems for CO2 level, which is controlled by the heat recovery ventilation system. The water consumption is reduced with 80% compared to a typical Irish dwelling, it has a BER rating of A1 and meets the Net Zero Energy Standard.



### **Amber Gardens – by Alesonor Tunari, Romania**

This luxury homes project includes 21 completed villas with a total of sixty planned. The houses are designed and constructed using bio-climatic design principles to achieve the ambitious Passiu Haus energy efficiency certification and, with photovoltaic panels installed, have already surpassed in 2014 the nearly “Net Zero Energy” standard due by European Directive in 2020.

Non-toxic coatings, adhesives, and other building materials ensure the future health of the families living at Amber Gardens. The homes and an adjacent playground and common garden use native plants and non-toxic and sustainably-sourced materials. The roads and sidewalks were designed and constructed to eliminate adverse environmental impact of the project site. This project is the first Green Homes approved project certified by RoGBC for detached homes.



### **One Herastrau Park Residence – by One United Bucharest, Romania**

This project, completed in September 2017, includes 106 apartments and has committed to achieve the necessary criteria established by the Green Homes certification program. The concept of integrated design and all sustainable strategies are being considered including: significant reduction of construction waste through responsible construction management strategies, operational waste separation for households, and energy efficient measures combined with an occupant educational program to optimize and reduce all the energy consumption throughout the building lifecycle.



### **Silken Park– by Durkan Residential Silken, Ireland**

This project was completed in 2017 and is a residential development with 59 homes. The buildings are very efficient in terms of energy consumption, meeting the Passive House standard requirements. It was rated with BER A2 and A3, was designed to reduce water consumption by 40% compared with typical Irish dwellings and provides charging stations for electric vehicles.



### **Aviatiei Park 1 – by Forte Partners Bucharest, Romania**

Aviatiei Park 1 is a residential complex of 176 units, located in the North of Bucharest in the immediate proximity of public transportation and surrounded by over 10 000 sqm of green spaces.

Aviation Park is a closed circuit residential project, in which the housing units are connected to each other via alleys, small public squares and other green spaces, offering a boost of privacy and exclusivity to the tenants.



**Casa Solaris – by Casa Solaris SRL  
Voluntari, Romania**

Is a single-family home located in the north of Bucharest that was competed in 2014 and certified in RoGBC's Green Homes program. It is the first of a mini ensemble of 3 individual pilot homes. It is an active house – producing more energy than needed for its current operation – due to the contribution of its 72 sqm of photovoltaic panels with surplus solar electricity being fed into the public grid. Casa Solaris is also equipped with 37 sqm of thermal collectors used for both domestic hot water production and winter heating, using an innovative approach of underground storage of the summer heat surplus eliminating the need for a heat pump. Energy efficient construction and smart solutions for heating and cooling reduced the energy load to approximately 50 Kwh/sqm/year. The technology provides a **healthy interior climate with controlled** humidity and uniform temperature without undesirable air flows.



**Central District  
– by Forty Management  
Bucharest, Romania**

This project of 40 units was completed in October 2017 and is Green Homes Certified by RoGBC. The innovative design concept of the building includes: complete LED illumination, plants and trees on

the facade and terraces to create a sense of nature for the residents, individual controls of heating and cooling, natural ventilation for the units, modular architecture for apartment reconfiguration, innovative architectural solutions for the terraces such as the active ceramics, filtering the air and presenting anti-pollution and antibacterial effects, non-toxic paints and adhesives, window adjustment for each apartment to enjoy a certain view and various energy efficient measures to optimize and reduce the energy consumption throughout the building lifecycle.



**One Herastrau Towers  
– by One United Properties  
Bucharest, Romania**

One Herastrau Towers, developed by One United Properties, is a residential project talking the Green Homes sustainability standards. The complex is Pre-Certified in the program and due to be completed in 2020.

The One Herastrau Towers project includes a mix of residential units, offices and commercial spaces. The ground floor of the building will have a commercial purpose and includes 5,055 sqm of office space. The two towers will contain 139 housing units. In addition, two levels will be allocated to the arrangement of parking spaces.

The two towers will offer the tenants a panoramic view towards Lake Herastrau and the northern area of Bucharest and large terraces. In carrying out the works, measures will be implemented to achieve a high level of energy efficiency.



**NIDUS Home– by NIDUS MNH  
Brezoii, Romania**

NIDUS Home is an innovative concept of a modular and configurable house, 100% prefabricated with natural materials such as straw insulation, optimized wooden structure and clay finishes. It is designed according to PassivHaus principles and has minimal maintenance and operational costs.

The prefabrication technology allows the construction time to be predictable and very short, so that it takes only 3 weeks for prefabrication and 5 days assembly on site. The modules that make up the NIDUS Home are transportable anywhere in Europe and the process of getting a house is very simple, compared to buying a car: you buy it, you get it, you start using it right away, without any other hassle. NIDUS has partnered with RoGBC to ensure its housing solution is delivered to meet the Green Homes certification criteria.



**The EFdeN Home – by Team EFdeN  
Bucharest, Romania**

The EFdeN house was designed by Romania's university team as an entry to the prestigious "Solar Decathlon Europe 2014" contest. The home was assembled in Paris for the summer contest and is now constructed at the Technical University of Construction – Faculty of Installation Engineering in Bucharest. The EFDEN house successfully defines sustainability and integrated green and healthy

materials. The central architectural prototype is a greenhouse providing a multi-functional integrated green space that delivers urban farming/ food production, natural daylight, indoor air quality, and passive solar heating as well as a relaxing living space. The project received the Green Homes certification from the Romania Green Building Council.



**Central District 4 Elemente  
– by Forty Management  
Bucharest, Romania**

Central District 4 Elements is located in the central area of Bucharest, on 7 Fizicienilor Street, a perfectly positioned place to quickly reach the vibrant areas of the city, but sufficiently low-key to feel the protection of a quiet community.

Central District 4 Elements means: **Air**, represented by large, spacious areas, from terraces and balconies that can receive tables with chairs to enjoy the morning coffee to generous receptions and large circulations; **Water**, represented by 3 large pools and garden fountains, located in the common yard of the blocks; **Earth**, represented by more than 2500 sqm of green spaces, with flower gardens, large trees and a promenade area; **Fire**, represented by about 500 sqm allocated to the social area, with bar, grill, sun umbrellas, tables, chairs, and an outdoor cinema – spaces that encourage discussions and building friendships between neighbors.

All these elements prove that there are no houses without soul and real estate development without a community. The project is due to be completed in August 2020.



**9 Rathmines Crescent  
– by Dublin City Council  
Dublin, Ireland**

This project owned by the Dublin City Council was completed in 2016 and certified by the Irish Green Building Council. It has 9 apartments and low operational costs due to careful design of form, insulation, junction and heat recovery ventilation system. It was built on a brownfield and its location enables very low carbon footprint from transportation and active lifestyles.



**One Herastrau Plaza – by One United  
Bucharest, Romania**

Through an integrated urban residence concept, the project’s two buildings will connect 147 apartments to essential neighborhood services and nearby recreation in parks and lakes; creating convenience and reducing transportation impact. Combining geometric and vegetative elements, One Herastrau Plaza is simultaneously its own square for residents and an extension of a natural landscape in the city. Bio-climatic design, a terrace, planted roofs and shaded streets are additional elements of green features of the project. The atrium in the outdoor plaza is covered with glass panels on an ornamental steel structure while the natural, locally-sourced, stone walls accent confers elegance. Ventilated facades contribute to the thermal performance of the buildings.



**Casa Capristo  
Ranica, Italy**

This project is a renovation of an existing house built in 1990 to make it highly efficient and sustainable. The project moved from the use of classic systems for heating, lighting and irrigation to the use of electricity from renewable sources. A photovoltaic system with amorphous panels was installed. The heating system was built with radiant floor systems supplied by a heat pump and solar thermal panels and produced domestic hot water eliminating the gas supply.

The entire building is equipped with air treatment with continuous recirculation inside the individual rooms to guarantee indoor air quality. Rainwater is harvested from the roof and reused for watering the garden and through an integrated system for the toilets. The electrical system **is realized with a domotic system in particular for the control of electrical loads that guarantees to be able to fully use the photovoltaic system.**

The envelope was made of wood fiber, to ensure maximum contribution from the thermal and acoustic point of view and together with the laid parquet have PEFC certification.

The windows are in wood-like aluminum and wood, with triple glazing and high transmittance performance. There are external shading systems such as sun-shadings that can be adjusted and integrated with the home automation system to guarantee maximum internal lighting in the individual rooms.



**Valley 21 – by Dalghias Development & Building the future  
Vama Buzaului, Romania**

This project includes 60 low impact, deep green homes that incorporate bioclimatic principles and green energy usage. The project has begun the construction of what will be the anchor of the community; a hospitality center. The model home was completed and certified in September 2016. The project merges modern and traditional building methods and incorporates local, sustainable materials.



**Casa Monica  
Modena, Italy**

This single-family building has achieved the top Platinum level with 89 points out of 110 according to the GBC HOME 2011 protocol; representing a model of sustainability with respect for the historical and architectural conditions of the building. The structure of the basement is made of reinforced concrete, while the floors above ground are made using prefabricated wooden structures.

The integrated energy production system involves the use of solar thermal, geothermal and photovoltaic, combined with a heat pump; no fossil fuel is used. The further optimization of energy consumption is achieved during the summer season by a free cooling

system, which allows in some phases of the summer season to be able to cool the house directly through the energy supplied by the ground, without the need to use the heat pump compressors. It is also equipped with a heat recovery controlled mechanical ventilation system with recovery yields exceeding 90%. The air exchange system during the summer season has the function of dehumidifying the rooms.



**Wings – by Studium Green  
Cluj-Napoca, Romania**

This residential project, developed by Studium Green, obtained the Green Homes pre-certification in 2019. Located in the Zorilor neighborhood west of Cluj-Napoca, the project comprises 228 apartments that have good public transit access and are well connected to numerous facilities including medical centres and commercial areas.

The biomimetic architecture offers an innovative and emblematic touch. The orientation of the building ensures abundant natural daylight throughout the day.

The unique configuration of the apartments is accompanied by a set of sustainability measures, such as: intelligent architectural and efficient LED lighting, mineral wool insulation, waste sorting via underground infrastructure, charging stations for electric cars, as well as 3500 sqm of green spaces within the complex, for the increased comfort and well-being of residents.



**Hemp House  
Sibiel – Sibiu, Romania**

This model house, scheduled for completion in December 2019, is a 100 sqm single family home that will utilize a combination of hemp and lime – both for the walls and for the insulation of those walls, roofs and doors.

The mix of hemp and lime ensures an optimal level of air humidity, and eliminates the risk of mold growth and the presence of pests, while also ensuring very good thermic insulation. The lime content absorbs Co 2 in the atmosphere for up to ten years and the manufacturing method requires only one third of the typical water consumption, decreasing the environmental impact of the building. All construction materials are 100% natural and of local origin.

The structure of the house is made of laminated wood with recycled wood used for the interior stairs and furniture, with locally produced wooden joinery.



**Lake District  
– by American Eco Homes SRL  
Iasi, Romania**

This project in the Miroslava community near Iasi has begun construction with plans for over 600 row houses with the first tranche certified in the RoGBC Green Homes program. The project uses innovative

structurally insulated panels to achieve superior energy performance, seismic resistance and construction quality while maintaining affordability. The Lake District project's homes include passive solar design and optimize natural ventilation, Forest Stewardship Council (FSC)-certified wood, low VOC paints, adhesives, and flooring and water efficient sanitary items and landscaping. The project's construction management diverts over 50% of construction waste from landfills (with 25% being standard industry practice).



**Over4 prototype - by Team Over4 Bucharest, Romania**

The Over4 house is a prototype designed and built by a multidisciplinary team of students from Romania - the Over4 team - for the Solar Decathlon Europe 2019 competition. It is a modular solar passive house, assembled and disassembled multiple times both in Romania and Hungary. It is built entirely from wooden materials from sustainable sources, meets each requirement of the passive house standard and has a PV system; creating an energy independent house. It was awarded the 3rd place in the Solar Decathlon Europe competition, is pre-certified by the Romania Green Building Council with Green Homes certification and is currently under the process of full certification.



**Jardine Hills - by Mason Jar Dealu Mare - Prahova, Romania**

Located in the wine region of Dealu Mare, "Jardine Hills" consists of an existing main house and guest cottage and three newly-constructed guest cottages that combine a modern, green approach with a rustic design. Photovoltaic panels provide off-grid electricity (3.6 kW), while solar thermal panels and a high efficiency heat pump supply hot water for domestic use and heating the swimming pool. The entire grounds are landscaped using sustainable principles including using drought resistant plants, natural mulch and a low water use drip irrigation system. Energy efficient windows, doors, insulation and other materials combined with a state of the art air to air heat pump system heat and cool the new guest cottages; each with separate thermostatic zone and controlled with a smart phone-enabled application for remote initiation, monitoring and adjustment.



**Belvedere Green Homes Residence Galati, Romania**

The Belvedere Green Homes Residence Residential Complex has 14 homes, divided into two 6-dwelling buildings (Sixplex) and a duplex house, designed specifically to meet the space and comfort needs of the owner, on the ground floor and on the first floor, with its own parking, terrace

and garden. Belvedere Green Homes Residence is located in one of the most coveted areas of Galati, a quiet area, in the vicinity Arcasilor Street and is the first Green Homes certified residential project in Galati by Romania Green Building Council.

The project offers a number of advantages and facilities:

- Access to local means of transport;
- In the vicinity of Metro, one of the most popular supermarkets in the city;
- The area is attractive for the inhabitants, it can be reached in a few minutes at Shopping City Galati, accessible by public transport or by car.



**Candominio Iannini L'Aquila, Italy**

Iannini condominium is the first post-earthquake Reconstruction Building certified by GBC Home. Particular attention was given to energy performance, reduction of environmental impacts and the maximization of comfort and healthiness of indoor environments. Unique, as the first realization in the Aquila area but perfectly aligned with the international practices that make Sustainable Building the main modus operandi to guarantee performances and investments. The building has achieved a 44% in water reduction and 59% reduction in energy consumption.





**Aviatiei Park – by Forte Partners  
Bucharest, Romania**

Located in the north of the capital, in an area that gathers new-wave companies and businesses, The Aviatiei Park Complex meets the needs of a young and dynamic audience to live close to the workplace and save time. Future residents of the complex will have the opportunity to enjoy the surroundings, take their children to The Herastrau Park, an 8-minute walk. For shopping, Lidl and Mega Image are right at the exit of the complex, and the Promenada Mall is a 2-minute drive away.

The Aviatiei Park complex offers one, two, three or four-room apartments with a warm and welcoming atmosphere where natural light is abundant and generous. Each space is efficiently partitioned, providing residents with various possibilities for fitting and usage, adapted to a modern lifestyle.



**One Charles de Gaulle – by One United  
Bucharest, Romania**

The 33 units within two, low height buildings of the residential compound respects a historic area and is dedicated to upholding the environmentally-friendly characteristics of Green Homes. This includes green terraces, high energy efficiency, use of natural materials and waste minimization and management during construction and operation

of the buildings. The project design is optimized to provide natural lighting and ventilation. Sustainable landscaping and lush gardens, carefully designed, complete the list of Green Homes benefits.



**Vision – by Studium Green  
Cluj-Napoca, Romania**

This completed project of 177 apartments delivers nearly 40% energy savings relative to standard, utilizes an existing building structure to minimize resource use and construction waste, is connected via public transit to the city center, and has easy, walk-able access to numerous facilities including shopping and schools. It was the first Green Homes approved project certified by the Romania Green Building Council.



**AFI City Bucurestii Noi – by AFI  
Europe Romania  
Bucharest, Romania**

The project developer, active on the Romanian market, agreed to achieve the necessary criteria to Certify a total of 1.688 units for a multi-family residential unit in the North East of Bucharest. All green energy and energy efficiency strategies are being considered at this early stage of the design project along with due consideration for site management and a plan for facilitated waste avoidance and management post occupancy.



**West Side Park – by Studium Green  
Cluj-Napoca, Romania**

West Side Park, developed by Studium Green în Cluj-Napoca, is a residential project comprising of 244 apartments.

The project stands out through the generous high performance windows and large balconies in each apartment, the ventilated facade includes photocatalytic ceramics, treated with titanium dioxide, which protects against pollution and constantly produces active oxygen. The project also hosts the largest green suspended terrace in Transylvania with an area of 2500 sqm along with other green spaces on the premises, freely accessible for tenants.

The West Side Park residential project was completed in 2019 and has received the class “A” for energy performance.



**Floreasca 1 – by 1development  
Bucharest, Romania**

This project of 22 luxury apartments – completed and certified in RoGBC Green Homes program in February 2015 – is in a premier residential section of Northern Bucharest, has good public transit access and is in a walkable district with shopping, schools, and other essential services nearby. The project provides superior energy efficiency and thermal comfort and incorporates sustainable landscaping and finishings including wood certified by the Forest Stewardship Council.



**One Mircea Eliade – by One United  
Bucharest, Romania**

One Mircea Eliade is developed on the site of the former Automatica factory, located between the Primaverii and Floreasca neighborhoods.

It houses 236 apartments and is part of a larger development project that includes: One Floreasca City, the One Tower office building, a Food Hall concept, restaurants, a gym with a swimming pool and adjacent to the Floreasca Park.

The project implements sustainability measures related to energy efficiency, responsible construction practices, resource optimisation, thus offering to the occupants alternative transportation options and a healthy interior environment.

The investment targets the entire area, not just the three buildings, that will result in a positive impact on the nearby road infrastructure.



**Petru Rareș 1259 – by Global Invest  
Bucharest, Romania**

The Petru Rareș 1259 residential project will be developed in two phases, totaling 177 Apartments. Located between Victoriei Square and Banu Manta Boulevard, the project is very well connected to the most important interest points in the city.

The compartmentation of each apartment was designed so as to ensure optimum functionality, paying attention to details and using quality interior finishes.

The Petru Rareș 1259 qualified for the Green Homes pre-certification and is projected to be completed in 2020.

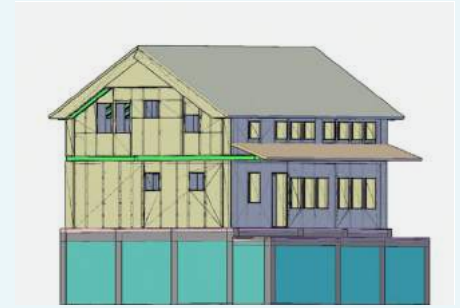


**OH Plaza – by One United  
Bucharest, Romania**

One Herastrau Plaza is a luxury residential project with 156 apartments, located in the vicinity of Lake Floreasca, Herastrau Park and the Promenada Shopping Mall. The setting ensures an easy access to all public transportation facilities.

Numerous features are included to minimize energy consumption, such as: automation of lighting in public spaces, separate energy meters for each tenant, LED lighting installations and motion sensors, biophilic design.

The complex offers special playgrounds for children, as well as many green areas. The finishes are made of high quality materials: hardwood floors, wooden decks for terraces with tiles and granite and non toxic varnishes and paints.



**Ecological House Slava Rusă  
Slava Rusă – Tulcea, Romania**

The 80 sqm family house will be entirely energy independent, using a mix of wind and photovoltaic energy. The house has a biodynamic design, offering maximum exposure to sunlight during winter and shading in summer time. The house will include solar panels for water heating, heat recovery ventilation system and heat pumps.

The structure of the house will be made of wood, while the roof will be made of reed; a local traditional material. Natural waste water treatment will be accomplished with the reed plantation. The house will be completed in 2020.



**Šumavský Dvůr  
Železná Ruda, Czech Republic**

Šumavský Dvůr is a unique mountain apartment in the heart of the Bohemian Forest, in a harmonious nature with a unique view and year-round sports. It offers above-standard architecture with comfortable services. Within the framework of a good climate and a quiet zone, the location was chosen to not damage the character of the whole landscape. The project was designed to be both comfortable and sustainable because it was built with a natural character, with renewable construction materials and it has been awarded the SBToolCZ silver certificate.



**Air Residences – by NAI  
Bucharest, Romania**

Air Residence – One, developed by NAI Romania, is a residential project located in the northern area of Bucharest near the Aviatiei district. The project comprises 11 apartments, distributed on 4 floors.

Air Residence aims to create a healthy living environment; symbiotic with nature.. Some of the sustainable features include mineral wool insulation, underfloor heating, photovoltaic panels in the common spaces of the building, aiming to reduce to zero the costs associated with the consumption of electricity in these common spaces. To encourage a sustainable lifestyle, the project provide a secured parking spaces for bicycles.



**X-LOFT  
Prague, Czech Republic**

Is a unique residential project located near the center of Prague in a quiet location of the original development of apartment buildings in Liben. An important part of the project philosophy is the economic and ecological operation of the house. The X-LOFT project was designed to save not only the costs for its inhabitants but also nature. Facade insulation, triple glazing, solar panels, heat recovery and rainwater retention ensures a significant reduction in operating costs. The low-energy

project has been awarded the SBToolCZ silver certificate, which assesses the quality of buildings in terms of sustainable construction.



**Green Campus – by Studium Green  
Cluj-Napoca, Romania**

The residential Green Campus, developed by Studium Green, was the first residential complex in Romania designed and built according to the green building criteria. The project promoted a variety of innovative solutions such as the use of environmentally friendly materials, zero VOC paint, LED lighting system for the common spaces, separate waste collection system for 5 waste types, energy efficient lifts with energy recovery, green façade and intensive green roof, recovered materials and over 50% of locally produced materials. The building has an area of over 15000 sqm and comprises 191 apartments.

Completed in 2014, Green Campus became the first green residential building in Romania, focused on innovation, environmental protection and occupant health and wellbeing.



**Selenium Retro 9 – Aşçıoğlu Insaat  
Istanbul, Turkey**

Selenium Retro has been designed and built in accordance with the LEED criteria set by the US Green Building Council (USGBC) to ensure healthy and

comfortable indoor conditions for all users. In addition to saving energy and water costs, the negative impacts of buildings on the environment were minimized in line with the criteria for material selection. In addition, with the implementation of these criteria, healthy living quality, productivity and cost optimization for the project’s inhabitants were achieved. In line with the environmental procurement policy, local and recycled materials and FSC-certified wood were specified to minimize environmental impacts.



**Residence “Leonardo da Vinci”  
– by Ascert srl  
Vicenza, Italy**

The architectural volumes are designed according to the maximum perception and use of sunlight, the quality of living and the considerable view, free of obstacles, on the Vicenza pre-Alps and the countryside. The geometry and the particular design and orientation of the roofs make them suitable to receive solar energy through photovoltaic panels.

The building is built in an urbanized area convenient to the center and is served by sidewalks, cycle paths and a developed public transport service. This residential development was awarded by GBC Italia with the Gold Certification. The water consumption is reduced by 39% compared to the baseline value. The condominium has been built with local or regional materials, with a high recycled content, and with third party EPD certification.



**Residence Galileo**  
**Costabissara, Italy**

The residential project completed in 2014 was the first to obtain the Gold level of GBC Homes. The complex develops a gross area of 1067 m2 and consists of 8 Energy Class A residential units. Among the various construction technologies used are the heat pump heating and cooling systems, the mechanical ventilation systems for hygienic renewal with heat recovery, the production of domestic hot water through thermal solar panels, photovoltaic panels to support the electric system, windows with triple glazing, and a rainwater recovery tank.



**Stejarii 2 – by Tiriac Imobiliare**  
**Bucharest, Romania**

Stejarii 2 is a residential project of 57 000 sqm, developed by Tiriac Imobiliare, in the Northern part of Bucharest.

Some of highlighted sustainability features include energy optimisation, measured to reduce the water consumption, sustainable materials, e-car charging stations, biophilic design, abundant daylighting and infrastructure for separate waste collection.

In addition, the complex offers a variety of services, from sports activities, to spaces for relaxation and wellness.



**Gramont – by BPM Development**  
**Bucharest, Romania**

The Garamont residential complex was built on the site of a former perfume factory, whose façade was recovered and fully integrated into the project.

It is located in the immediate vicinity of Carol Park, as well as some important cultural objectives of Bucharest: the National Museum of Contemporary Art, the Mausoleum in Carol Park, the Technical Museum and the National Library. The site provides very close proximity to kindergartens, primary schools, high schools and national colleges, universities and academies.

Some of the sustainability features include responsible construction practices, sustainable materials, energy efficiency, biodiversity improvement, superior interior air quality, biophilic design and alternative transportation solutions.



**Camelia Warsaw – Bouygues Immobilier Polska**  
**Warsaw, Poland**

This HQE Excellent certified residential project was completed in 2018 and is located in the capital of Poland. The total usable floor space of this residential development is 7.900 sqm representing. These are 161 high quality apartments with low energy consumption in the heart of Warsaw.



**Rahmaninov Residences**  
**– by Rahmaninov Residences 50-70**  
**Bucharest, Romania**

The Rahmaninou Residential project is a luxury property located in the immediate vicinity of Verdi Park and Lake Floreasca, offering panoramic views. The residences include 6 floors covering a built area of 23,000 sqm; the project is well connected to the office area in the north of the Capital. The project will include a cafe, concierge service and other easily accessible amenities. The project excels in the energy efficiency area, offers a superior interior air quality, uses high performant materials, e-car charging stations, sustainable green spaces and innovative waste management solutions.



**Home Cast – by Building srl**  
**Almese, Italy**

This building, awarded by GBC Italia with a Gold Certificate, was created from the will of the clients to create a sustainable and efficient home. It was designed to ensure strong energy efficiency performance due to careful planning of the thermal envelope, glazing and the use of the sun as an energy source. The need to make the most of solar radiation in the winter period was met by the construction of large south-facing windows and solar collecting greenhouse. The building is shaded during the summer by appropriately-designed overhangs.

# Notes

## Green Homes Solution Providers in the program today!

for details, check <https://greenhomes.solutions/>

With green products such as mineral wool insulation with biobased, formaldehyde-free ECOSE™ technology and UrbanScape™ lightweight green roof solutions KNAUF Insulation became one of the first Green Homes Solution Provider.



VELUX roof windows provide natural daylighting and natural ventilation and use sustainably harvested forest products.



EV CONNECT's car charging stations are manufactured and include fast charging options for a variety of plug-in-hybrid and full electric vehicles.



# Notes

## Green Homes Solution Providers in the program today!

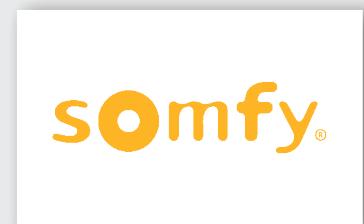
Rigips Activ'Air® is a ceramic core plasterboard that captures, retains, and decomposes formaldehyde in the household; contributing to significantly healthier indoor air quality for the occupants.



Kronospan is today the leader in the production of wood-based boards of the highest quality for both the internal and external market.

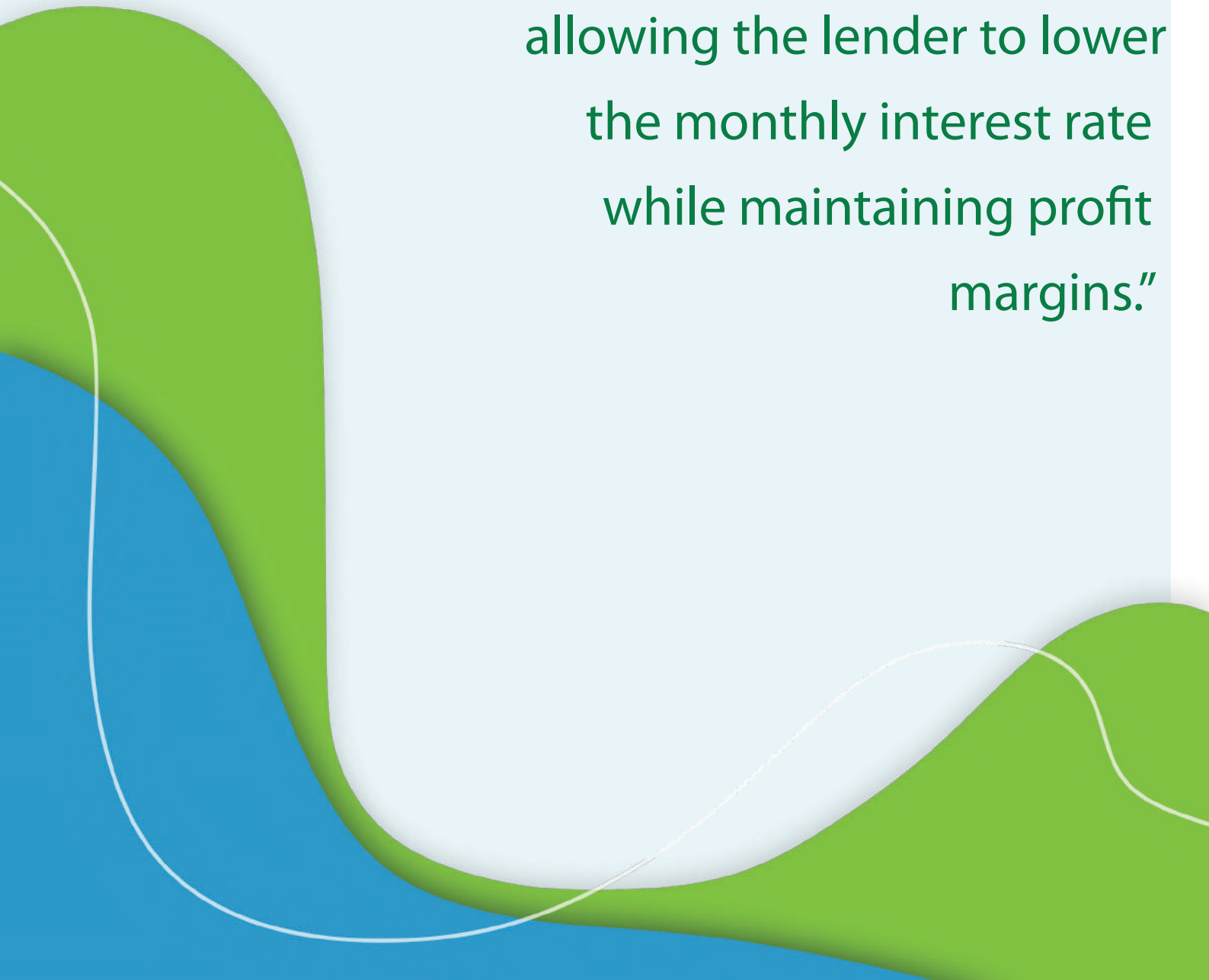


From the first roller motor to connected home solutions, we have helped create a comfortable lifestyle for millions of users around the world.



ALUKÖNIGSTAHL is a successful family-owned company operating at the fourth generation level and presently active all over Europe.





“Increased energy savings and other financial benefits substantially reduce the mortgage default risk allowing the lender to lower the monthly interest rate while maintaining profit margins.”



For more information  
please contact

[Monica.Ardeleanu@RoGBC.org](mailto:Monica.Ardeleanu@RoGBC.org)

[Steven.Borncamp@RoGBC.org](mailto:Steven.Borncamp@RoGBC.org)

OFFICE: +40 738 182 421



This project has received funding from the European Union's  
Horizon 2020 research and innovation programme  
(grant agreement No 847141).