EeMAP
Energy efficient Mortgages Action Plan

CREATING AN ENERGY EFFICIENT MORTGAGE FOR EUROPE

BUILDING ASSESSMENT BRIEFING: ITALY

Green Building Council Italia

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Green Building Council Italia

ABOUT THE GREEN BUILDING COUNCIL ITALIA

Green Building Council Italia (GBC Italia) is a non-profit association bringing together the most competitive companies and the most qualified Italian associations and professional communities active in the sustainable building industry.

With a network of over 300 members, GBC Italia promotes a transformation of the Italian construction market through the promotion of LEED certification system and its own certification systems targeted specifically for the Italian context. GBC Italia elaborated specific rating systems for the certification of historic buildings (GBC Historic Building), for residential construction (GBC HOME) and for neighborhoods (GBC QUARTIERI).

GBC Italia's mission is to foster collaboration between all sectors of the property and construction industry, government, academic institutions and all other stakeholders in order to transform Italian's built environment into green built environment adapted to suit the traditional culture, architecture and environment of Italy.

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www.energyefficientmortgages.eu

INTRODUCTION

The initiative Energy Efficient Mortgage Action Plan – EEMAP aims to create an EU-wide, standardized, "energy efficiency mortgage", to encourage building owners to improve the energy efficiency of their homes or purchase high-performing properties, taking advantage of the preferential financial conditions of the loan.

The initiative is based on the premesis that energy efficiency can reduce the financial risk for banks because of the increase in the value of the property, and because the mortgage contractors will be able to face the mortgage payments with greater security thanks to the reduced energy costs, with minor risk of failure of the operation. In these terms, the investment on energy efficiency loans will represent a lower risk for the balance sheet of a bank and therefore the capital dedicated to it will have a better financial treatment. Being able to consider a lower risk investment capital represents a strong incentive for banks to enter the market and, as a result, lead to a wider chain of incentives in which all the stakeholders in the supply chain, including European citizens, providers, investors and society, can benefit.[01]

The pilot phase of the EEMAP project is expected to start in summer 2018 and will target a number of key European mortgage markets. This document, aims to frame the Italian context in which this innovative financial tool will be tested.

The document analyzes the national building stock, the national energy efficiency and building renovation policies, applicable norms and regulations for energy certification and energy metering. In particular, the analysis is focused on residential buildings as new construction and building renovation cases of either single houses or multifamily blocks.

The document also proposes some examples of national best practices to indicate possible solutions to the main identifiable barriers to the application of the financial tool in Italy, such as, for example, the difficulty of obtaining large-scale preliminary data and the verification of energy performance after building works to guarantee predicted energy saving.

Solutions to go beyond energy efficiency and to evaluate the sustainability of renovation activity are proposed, such as GBC Italia rating systems dedicated to residential buildings.

THE CHARACTERISTICS OF NATIONAL RESIDENTIAL BUILDING STOCK

Results of the last ISTAT census, set in 2011, demonstrated that residential buildings account for 12.2 million with over 31 million dwellings. Some 26% of residential floor area belongs to single-family buildings while 74% belongs to multi-family buildings.

The total number of currently occupied dwellings is 24,136,177. The average number of rooms per dwelling is 4.25 and the average number of inhabitants per room is 0.57.[02]

More than 60% of buildings in Italy are over 45 years old, meaning before the law n. 373 of 1976, the first national law on energy saving. Of these buildings, over 25% record annual consumption from a minimum of 160 kWh/m^2 per year to over 220 kWh/m^2 per year.[03] On average, residential buildings consume 160 to 180 kWh/m^2 per year (electricity energy + heating needs).[04]

A building's age does not necessarily imply a poor state of preservation of building fabrics, but it should be noted that around 2 million buildings were considered by the same ISTAT census, in a poor (15%) or bad (1.7%) state of conservation.

The ageing of building stock concerns urban areas mainly, and it is a phenomenon that tends, of course, to grow over time. The projection elaborated by CRESME in terms of housing units on the building stock over 40 years old*, demonstrates that in metropolitan cities, properties over 40 years old represent 76.2% of the stock in 2011, but in 2021 these will be 85.2%: in towns, they will increase from 68.7% in 2011 to 79.7% in 2021.[05]

In relation to the size and status of the building stock, it is clear that the renovation and maintenance of Italian housing assets will increasingly become strategic for the construction sector.

IMG 1 – Distribution of national residential assets by year of construction.
The first law on the energy efficiency of buildings was L. 373/1976.

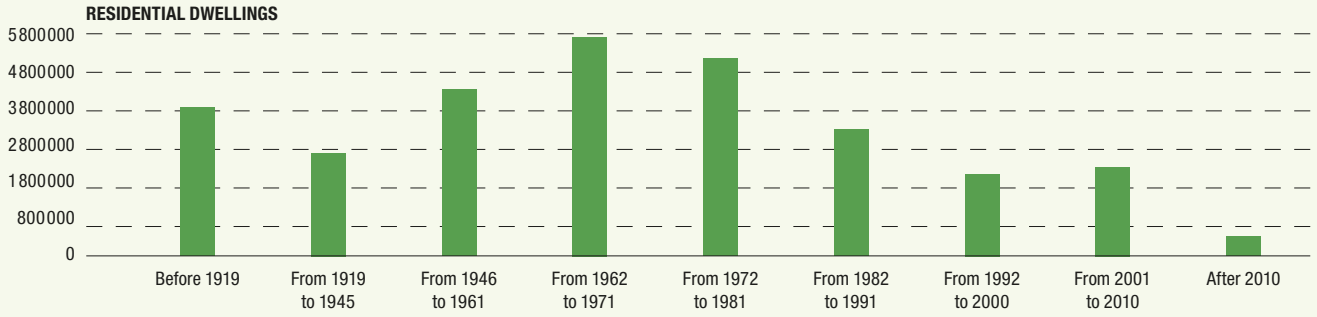

TABLE 1 – State of conservation of Italian real estate assets in 2011[02]

DATE OF BUILT	STATE OF CONSERVATION				
	Excellent	Good	Average	Bad	Total
Before/in 1918	420,010	896,196	441,737	74,561	1,832,504
1919-1945	252,311	672,771	348,766	53,159	1,327,007
1946-1960	348,354	940,919	375,174	36,389	1,700,836
1961-1970	500,985	1,209,616	320,106	20,126	2,050,833
1971-1980	630,428	1,254,545	221,145	11,533	2,117,651
1981-1990	552,294	800,786	104,265	5,422	1,462,767
1991-2000	508,386	334,992	25,896	1,743	871,017
2001-2005	349,174	106,670	6,718	542	465,104
From 2006 on	308,662	46,791	3,960	566	359,979
TOTAL	**3,870,604**	**6,265,286**	**1,847,767**	**204,041**	**12,187,698**

* The threshold of 40 years old is set by technology studies as an alert for the need of extraordinary maintenance of buildings to keep basic functions.

THE SIZE OF THE MORTGAGE MARKET AND HOUSING COSTS

In 2016, the purchase and sale of houses supported by mortgage loans accounted for 246,182 units, 27.3% more than the same figure recorded in 2015. The increase is substantial, exceeding 25% in all areas of the country.

Generally speaking in 2016, the mortgage market in Italy supported the purchase of medium-sized homes mainly, followed by medium-small and small-sized homes.[06]

According to data reported in the Italian Statistical Yearbook[07], "just over 3.2 million families (17.7% of those living in private homes) pay a mortgage. The average monthly installment is €586.41, with a variability in the territory ranging from €619 in the center to €497 in the Islands; in metropolitan cities, €636 per month are reached.

In the rental market, in 2015 18% of households pay a rent for the dwelling in which they live: the percentage is lower in the Islands (10.8%), where it is about half of those in the Northwest and in the South (both around 20%) of Italy. At national level the average rent expenditure is €430.56 and rises to €506.55 per month in the North-West, where the payout is more. The rent is more widespread in metropolitan cities, where 25.5% of citizens pay a rent, where the average cost is about €476.67 per month, €80 more than the average observed in towns up to 50 thousand inhabitants.

Among other expenses for utilities and services, the bill for gas and other fuels is the most relevant, for which households spend an average of €66.99 a month, with values above €81 in North, absorbed in large part by the heating cost. The second largest expenses for utilities and services of the dwelling is electricity (with an average of €47.87) which records its maximum value in the Islands. The bill related to the collection of waste is equal, on a national average, to just under €20 per month.[08]

NATIONAL POLICIES FOR THE ENERGY EFFICIENCY OF BUILDINGS

Increasing energy efficiency in buildings is a priority objective for Italy. The National Energy Strategy (SEN), in its 2017 updated version, currently under consultation phase, states that residential and transport sectors will reduce energy demand by 5 Mtoe to 2020 and by 9 Mtoe in 2030.[09]

Among the main initiatives proposed for the civil sector, improving the energy efficiency of residential buildings is a priority action. The SEN proposes to improve the mechanism of tax deductions by rewarding radical interventions on the entire building (deep renovation) characterized by the best cost-effectiveness ratio.[09]

To support loans from banks, the SEN also provides for the expansion of the number of interventions that can be supported by the constituting guarantee fund for energy efficiency. The fund will favor the types of standardized intervention with certain energy savings based on a pre-established list characterized by specific parameters (e.g. energy class of the building, climate zone, type of intervention).[09]

To achieve the objectives set by the SEN, the Energy Renovation Strategy of the National Real Estate estimates a total energy saving potential of about 4.2 Mtoe by 2020, with investments for residential sector equal to about 13.6 billion €/year for global interventions and 10.5 billion €/year for partial interventions.[04]

The Interministerial Decree 26/6/2015 "Application of the calculation methods of energy performance and definition of the minimum requirements of buildings" provides that:

- by 1 January 2021 all new buildings or those undergoing first-level renovation shall be almost zero-energy buildings
- from 1 January 2019 the same buildings occupied by public bodies and owned by the latter shall be almost zero-energy buildings.

TABLE 2 – D.M. "Minimum Requirements": specifications for categories of intervention

Category	Definition	Main minimum requirements
New building	New construction; demolition and rebuild; enlargement >500 m^3 and 15%	Minimum requirements on the building as a whole for: Ht (heat transmission coefficient), efficiency of the heating/cooling system, Energy Performance indexes
Major Renovation	1st level renovation: renovation on >50% of dispersing surface and heating/cooling system	
	2nd level renovation: renovation on > 25% of dispersing surface, with or without heating/cooling system	Minimum Ht requirements on the renovated part + minimum U requirements for building elements and efficiencies for heating/cooling system
Energy efficiency renovation	Renovation up to 25% of dispersing surface or on heating/cooling system	Minimum U requirements for the parts of the building fabric o for the new heating/cooling system

NATIONAL SUBSIDIES FOR PRIVATE RESIDENTIAL ASSETS RENOVATION

Article 3 of the 2018 national financial law, among the measures for growth defines important innovations in terms of subsidies for building renovation and energy efficiency improvements in buildings[11].

2018 renovation bonus[12]

It is possible to deduct from IRPEF (personal income tax) a portion of the costs incurred to renovate the houses and the common parts of residential buildings located in the territory of the State. In particular, taxpayers can take advantage of the following deductions:

- 50% of the costs incurred (credit transfers made) from June 26, 2012 to December 31, 2017, with a maximum limit of 96,000€ for each housing unit
- 36%, with a maximum limit of €48,000 per real estate unit, of the sums that will be charged from 1 January 2018.

The subsidy can be requested for the expenses incurred during the year, according to the cash flow criterion, and must be divided among all the subjects that have supported the expenditure and who are entitled to deduction.

Anti-seismic measures

The deduction of the expenses incurred for the interventions for the adoption of anti-seismic measures can be used both by the taxable persons under the

TABLE 3 – Summary of subsidies for anti-seismic measures[12]

	Up to 31/12/16	2017-2021
Subsidy amount	65%	50%
		70% (75% multifamily buildings) if, after building works, a lower class of risk is reached
		80% (85% multifamily buildings) if, after building works, the risk is reduced by 2 classes
Maximum cost on which calculating the subsidy	€96.000	For building measures on common areas of buildings: €96.000. For the whole building: €96.000 *n. of dwellings In the building.
n. of installments	10 annual installments	5 annual installments
Seismic zone	Zone 1 and 2	Zone 1, 2 and 3
Use	—	Any residential property of production site

IRPEF tax system and by the IRES (company income tax) taxable persons. The deduction percentage and the rules are different depending on the year of the expenditure.

Table 3 and 4 summarize the characteristics of tax relief in anti-seismic matters.

TABLE 4 – Summary of subsidies for the purchase of a anti-seismic property[12]

Subsidy amount	Maximum cost	Clauses
75% of cost (if a lower class of risk is reached)	€96.000 for each building unit	– Building are located in an area classified as Risk 1 – The property is part of a building demolished and rebuilt for reducing seismic risk – Building works are carried out by construction firms that within 18 months of conclusion sell the properties
85% of cost (if the risk is reduced by 2 classes)		

IRPEF deductions of 19% of mortgage interest expenditure

Taxpayers who renovate or build the main house, can deduct from the income tax the 19% of mortgage interest expenditure and the related ancillary charges paid on the mortgage loans stipulated for such purposes

The maximum amount on which the 19% deduction is calculated is equal to € 2,582.28 for each tax year.[12]

Ecobonus 2018[13]

The main financial tool to facilitate building renovation is the Ecobonus, the mechanism of tax deductions introduced by the 2007 financial law as a temporary tool, then annually reconfirmed.

For the year 2018, 65% tax deductions for the improvement of the energy efficiency of residential buildings are confirmed. The measure covers a maximum expenditure of €100,000, covered as tax deduction and subdivided over 10 years. If building works involve the whole fabric, the subsidy is increased both in the deduction and in the time frame. Beneficiaries can give their tax credit to suppliers and other private entities, but not to banks or other financing institutions.

Table 6 shows the specifications relating to the measure.

Between 2007 and 2015, more than 2.5 million interventions were encouraged, with over €28 billion invested by families. The total primary and final energy saving in 2015 was about 1.02 Mtoe / year.

Data published annually by ENEA on the application of tax deductions show that in 2013 about 68% of subsidies were invested in window replacements, followed by new heating systems with 23.4%, only 0.4% of the financed interventions concerned the entire building envelope.

This result represented a loss of opportunity to implement deep renovation in favor of interventions more within the reach of the homeowners.

TABLE 5 – Summary of subsidies for energy renovation Ecobonus[13]

Subsidy amount	Period of application	N. of installments	Clauses
55%	Up to 05/06/2013	10 annual installments	—
65%	06/06/2013 – 31/12/2017	10 annual installments	EE measures on individual dwellings
65%	06/06/2013 – 31/12/2017	10 annual installments	EE measures on common parts of a multifamily building and on all dwelling units of the multifamily building
70%	01/01/2017 – 31/12/2021	10 annual installments	EE measures on common parts of a multifamily building that count for more than 25% of the gross heat- dispersing surface
75%	01/01/2017 – 31/12/2021	10 annual installments	EE measures on common parts of a building of multifamily buildings aimed at improving winter and summer energy performance and reach at least average quality in compliance to D.M. 26/06/2015

TABLE 6 – Maximum subsidies for each type of measures[13]

Energy efficiency measure	Maximum subsidy
Full energy renovation of existing buildings	€100,000
Energy renovation of the building fabric (walls, windows..)	€60,000
Solar panels integration	€60,000
Substitution of heating system	€30,000
Purchase and installation of solar shading devices as in Annex M of law n. 311/2016 (for the years 2015, 2016, 2017 only)	€60,000
Purchase and installation of heating system fueled by biomass (for the years 2015, 2016, 2017 only)	€30,000
Building system automation (for the years 2016 and 2017 only)	Without a limit
Renovation works on common parts of multifamily buildings suitable to receive subsidies up to 70% and 75%	€40,000*n. of dwellings in the multifamily building

The Conto Termico

The Ministerial Decree (D.M.) 16/02/2016, called Conto Termico (Thermal Account), is a capital support scheme consisting of a non-repayable grant on eligible expenses with amounts ranging between 45 and 60% with cost ceilings for individual expenses. The Thermal Account is aimed at public administrations and individuals, with an annual contribution of €200 million and €700 million respectively. However, the eligible interventions for private users are only related to the production of thermal energy from renewable energy sources. Subjects can access it directly or via ESCO.[14]

ENERGY PERFORMANCE CERTIFICATES

The D.M. "Minimum Requirements"[10] defines the national guidelines for the certification of the energy performance of buildings to ensure the promotion of adequate levels of quality, ensure the usability, dissemination and increasing comparability of energy performance certificates (following indicated as APE), on the entire national territory in compliance with Directive 2010/31 / EU and the legislative decree, promoting the protection of users' interests.

The APE has a maximum validity of ten years from the date of its issue and it is updated to any renovation intervention involving building elements or technical installations in such a way as to modify the energy class of the building or of the building unit.

In the case of a sale or lease offer, the corresponding advertisement, published on all commercial media, shows the energy performance indexes of the envelope, the global energy performance index of the building or the real estate unit, both renewable or not, and the corresponding energy class.

In order to carry out quality checks on the certification of energy performance made by assessors, regions and autonomous provinces define control plans and procedures that allow the analysis of at least 2% of the APEs deposited territorially in each calendar year.

Controls are mainly geared towards the most efficient energy classes and include: (a) assessment of APEs certificates; (b) assessments of the consistency of the project or diagnosis data with the calculation procedure and the results expressed; (c) inspections of works or buildings.

In case of non-compliance with energy certification of a new construction or in case of major renovation (see above) a fine ranging from €3,000 to €18,000 may be charged. Depending on the case, the builder or owner of the property can be sanctioned, and the penalty is imposed by the local authority (municipality, region, etc.). For leases of individual housing units, the penalty (applicable in the case of non-delivery to the tenant, with the relevant clause on the contract) ranges from €1,000 to €4,000 (halved if the lease does not exceed three years). If the data on the energy parameters of the property are missing in the sale or lease advertisement, the penalty varies from €500 to €3,000.

COLLECTION OF CERTIFICATES AND DATA ACCESSIBILITY

As required by the legislative decree, ENEA, after consulting the regions, set up the national database, called SIAPE, for the collection of data on APEs, heating systems checks and related inspections. The system is interoperable with regional land registers, thermal plants registers and with regional SIAPE. Every year the Regions are asked to update the data of the national SIAPE with those of the regional databases. The regions access all the SIAPE data of the reference territory, while they access the national SIAPE data in aggregate form only. Citizens can access the data present in the SIAPE in aggregate form. Currently, 14 Regions and Autonomous Provinces have established the energy cadastre.

Citizens and notaries generally have access to the lists of professionals performing energy certification or to individual APEs if they have the reference code.

Open data, in aggregate form, are only available in some regions (Lombardy, Emilia Romagna, Veneto, Sicily).

CALCULATION METHODOLOGY

For new construction, the calculation method is defined "as design": standard data are used for user behavior and for climate, while for the building (geometry, fabric and systems) project data are used. Energy performance is calculated with the support of certified software.

For existing buildings, the calculation method is defined "as building survey": standard data are used for user's behavior and for climate, while for the building (geometry, fabric and systems) data are collected by means of a building survey or defined by comparing the building to a reference building with similar facilities by age and type. Energy performance is calculated with the support of a certified software.

For the calculation of the energy performance of buildings, including the use of renewable sources, the national technical standards are adopted and their subsequent modifications and additions, prepared in accordance with the development of the EN standards to support Directive 2010/31 / EU, as well as the rules in annex 2 to this decree.

The APE does not certify the energy consumption of the building, but allows the evaluation of its energy quality to allow comparison with other buildings on equal terms. Only a precise analysis and monitoring over time of all the variables (internal temperature, the air infiltration rate, the real performance of the enclosure and, as regards the centralized production plants, the settings, the operating status and maintenance) can provide useful information to compare with what is evaluated in the certification. User behavior in building and plant management also affects consumption.

A precise energy diagnosis on an individual building can identify the critical issues that characterize the energy consumption of the building.

MEASURING ENERGY PERFORMANCE

Between 2015 and 2016 the total amount of energy used by households for domestic use (heating / cooling, hot water, kitchen use and home appliances) and for own transport decreased by 1.5%. The corresponding expenditure incurred for the purchase of energy decreased by 8%. In 2016, domestic use accounts for about 65% of household energy use measured in physical terms and for 59% of the total expenditure incurred for the purchase of energy products. The amount of energy used for domestic purposes has grown by 1% between 2015 and 2016 (-9.7% in 2014 compared to the previous year and +10.3% in 2015), while spending decreased by 5,2% (in 2015 it had grown by 3.8%).

According to preliminary estimates made by ISTAT, to meet domestic needs in 2016, natural gas ("methane") is used for 54%, and biomass for 21% (in particular firewood), 18% electricity, for almost 4% both diesel and LPG and in negligible quantities other energy products (manufactured gas, lamp oil and fuel oil). In terms of spending, Italian households spend mainly on the purchase of electricity and natural gas (about 86% of spending): in 2016 about €35.7 billion, distributed around 50% between electricity and natural gas (in 2014, the situation was the same as in 2016, while in 2015 €37.6 billion was spent, of which 51% for methane and 49% for electricity); far less is the expenditure for LPG, biomass and diesel: in 2016 about €5.8 billion in total (-5% compared to 2015 and -9% compared to 2014).[15]

BEYOND EPC: ENERGY EFFICIENCY AUDIT

When renovation works include the retrofit or substitution of a heating/ cooling services with nominal power equal or above 100kW, the article 5.3 of the annex 1 to the DM Minimum Requirements[10], requires an energy audit of the building and of the services to provide a deeper analysis of the energy demand, to compare different options and their effectiveness under cost profile (investment, operation and maintenance).

The energy audit is defined by the EU norm EN 16247:2014. Specifically. Part 2 of the norm is applicable to specific energy audit requirements in buildings. The norm specifies the requirements, methodology and deliverables of an energy audit in a building or group of buildings, excluding individual private dwellings. This standard may cover multi-dwelling apartment blocks where communal services are supplied from a landlord. It is not intended for individual dwellings and single-family houses.

The purpose of the energy audit is going beyond a steady state analysis of the energy demand at standard condition of the building, to simulate the energy demand according to the building and services use and real climate and compare with current costs of energy bills. Moreover it supports the decisional process for building and services renovation with a detailed analysis of cash-flow and expected cost savings related to different renovation options.

DIFFUSION OF SMART METERS IN THE NATIONAL TERRITORY

The European Directive on energy efficiency (No. 2012/27 / EU) defines a "smart metering system" as an "electronic system capable of measuring energy consumption, providing more information than a conventional device, and transmitting and receiving data using a form of electronic communication". Smart metering systems consist in the detection of consumption data – information owned by the user himself – with a high frequency (at least hourly) and in making them available to the customer, in general after sending to a centralized platform where the data can be appropriately reprocessed. From these re-elaborations, the user can firstly derive useful information to adapt his consumption methods and focus them on greater efficiency, for example through better management of equipment that consume electricity. Secondly, the user can let his consumption data be used by third parties, who organize for him, for example, automated systems for programming the use of his appliances.

Electric energy[16]

The second generation of smart electricity meters provides a tool for end users to be aware of electricity consumption by viewing energy usage and persuasive information on reducing consumption. E-Distribuzione (Enel) has received the green light to install 1.7 million new meters in 2017 and to change 32 million by 2021 (over 40 million by 2031).

Gas[16]

The replacement of traditional gas meters with smart meters was initiated by AEEG, starting from the highest flow meters (class G40 and above) and was progressively extended to the first intermediate meters and, from 2013, to the gas meters of lower flow rate for domestic use (G4-G6 class).

The AEEG has progressively updated the plan to replace gas meters, taking into account the implementation difficulties. Currently, a target of 50% of G4-G6 smart gas meters in service is expected to be reached by 2018, having completed the installation of the smart meters for gas of the upper classes for that date.

Heat metering systems at dwelling level

Legislative Decree No. 102/2014 and its corrective 141/2016 have defined the obligation to adopt heat metering tools, thermostatic valves, within the individual housing units, in order to comply with the legal limits and to restart the costs of managing central heating according to an accounting system that takes into account the virtuous behavior of the users. With the Decree Law 244 of 30 December 2016, the obligation to use the valves starts from June 2017. Penalties are provided for defaulters.

PRELIMINARY ANALYSIS ON THE ENERGY PERFORMANCE OF THE BUILDING STOCK

To carry out a preliminary analysis of the energy savings gained from the application of certain building works and consequently estimate the feasibility of a mortgage for energy efficiency of a given property, it could be useful to start from a comparison of the given building performances with those of an existing database of sample buildings then continue with a more precise analysis.

Case study 1: Web tool of the TABULA (Typology approach for building stock energy assessment) project[17]

The Italian building stock was chosen as a case study of the TABULA project, funded by the European Intelligent Energy for Europe program, which has created a harmonized analysis of European building types with a particular focus on residential buildings. The results of the Tabula project in Italy could be functional to the preliminary analyses needed for a first high-level feasibility assessment.

Each participating country has developed the "National Construction Typology" which consists of a set of model residential buildings with typical energy characteristics. Each building-type represents a certain period of construction and a specific size.

Building-types have been used in each country as a means of expressing energy performance and energy saving potentials achievable through renovation actions of the building envelope and of the heating systems. Two levels of building renovation have been analyzed: a "typical renovation", through the application of measures commonly used within the country, and an "advanced renovation", through the introduction of interventions that reflected the best available technologies. Additional information on the frequency of building and plant types has made it possible to use the typological classification as a model for estimating the energy performance of the building stock at national scale.

Calculations on demonstration buildings were made using the asset rating method according to the national implementation of the EPBD and showing the energy performance before and after renovation. The main result of the project is a webtool[18] which, for each typology provides data on the dispersing surface, transmittance values, plant efficiency and other indicators.

The published data can be used by all the experts of the European countries for the evaluation of national building stock, for comparison among countries and for scenarios evaluation. The webtool is a demonstration tool: for each building type, an online calculation shows the potential for energy savings obtainable with standard and advanced energy saving measures.

GOOD NATIONAL PRACTICES OF PUBLIC-PRIVATE FINANCIAL INITIATIVES

Three national case studies, that represent innovative financing schemes for the implementation of energy renovation of private and public buildings, follow. The case studies are interesting for several reasons: (i) from a financial point of view, to understand what schemes have been envisaged and what agreements private investors have reached with the public body and with private individuals, (ii) to understand what guarantees on the quality of the interventions and on the energy performance were requested and, finally, (iii) to understand the role of the actors involved.

Case study 2: Province of Trento, Resolutions 846/2016 and 1640/2016 renovation of multifamily buildings – Incentives for energy efficiency and the use of renewable sources[19]

In 2016 the Province of Trento introduced some incentives to improve the energy efficiency of multifamily buildings. For this type of property three types of measures have been envisaged: (i) energy diagnosis and verification of the health status of the building; (ii) design and technical assistance for the realization of interventions; (iii) reduction of the interest rate of loans taken out to cover the expenses related to the interventions.

On the last point, the Autonomous Province of Trento has signed an agreement with a pool of banks for loans reserved to multifamily buildings. The province has pledged to cover the discounted interest on a ten-year loan contracted by the condominium with one of the affiliated banks to finance the total intervention (works and planning). There is a maximum total spending limit of €100,000 and a minimum limit of €5,000 (for a mortgage of €30,000).

The terms of completion and reporting of the intervention are set at 24 months from the communication of grant. The contribution amounts to 15% of the loan if a first level renovation is foreseen, or 10% of the loan for a second level renovation or energy renovation. A further 5% is added if certain conditions are met: unanimity of the tenants, stipulation of the energy saving contract, achievement of the C+ or B+ energy class in case of first level renovation. There is a limit of contribution that corresponds to 90% of discounted interest rate, calculated on a maximum rate of 3.5%.

Case study 3: The CERtuS project – Cost efficient options and financing mechanisms for nearly zero energy renovation of existing building stock[20]

The CERtuS project aims to help stakeholders gain confidence with energy redevelopment interventions aimed at the NZEB targets related to municipal buildings in southern Europe.

Municipalities, energy service companies and financial institutions in Italy, Greece, Spain and Portugal have been involved in this project. Pilot projects of deep renovation were envisaged to act as replicable models. In all twelve pilot cases of CERtuS, the municipalities did not have the resources to fully finance the planned measures, therefore it was necessary to involve private partners through the energy performance contract tool and third party financing. Precisely this requirement makes the evaluation of the "technical / economic convenience" of the realization of a nZEB transformation more pressing.

To reach the nZEB standards, the first step was to define the actual conditions of the building by performing an energy diagnosis. In most of the twelve cases, data on consumption for at least 3 previous years were examined, as well as construction documents and information on the fabric and building services.

Thermal energy consumption, heat losses and their distribution through different elements (eg windows, walls, etc.) have been evaluated using existing data and calculation tools. It was also useful to estimate the optimal consumption in the prevailing conditions, analyzing both what could be achieved with the existing systems and what had to be done to achieve the objectives of the building manager. For each case study of the CERtuS project, the objective of the energy project was compared with the current situation to assess the real potential of energy saving and what interventions could be done on the housing, on the heating and cooling system, ventilation and possibly on home automation systems if present.

CERtuS pilots achieved a sustainable economic implementation of the renovation schemes that implies an average pay-back period of 15 years for the 12 model cases. The necessary cumulative investment to implement the nZEB renovation options is €36,917,428. CERtuS has optimised investment and showed that the set targets can be achieved with an average cost of €/m^2 117,4. This is the cost used to calculate the actual achievement instead of the planned €/m2 1400 (which involved deep renovation on the building envelope, an option that was applied in very few CERtuS buildings). This investment according to the CERtuS project outputs can be ensured by a combination of funding sources including ESCOs, soft loans, senior debts and VAT facility.

BEYOND ENERGY

Looking beyond the topic of energy saving, GBC Italia elaborates and promotes specific rating systems to assess the sustainability of buildings, including the focus on: site sustainability, water management, energy and atmosphere, material and resources, indoor air quality, innovation in design and local priorities. Specifically tailored for the national building sector, GBC Italia elaborated three rating systems for the certification of historic buildings (GBC Historic Building), for residential construction (GBC HOME) and for neighborhoods (GBC QUARTIERI). Moreover, to answer market demand of building renovation, GBC Italia is developing another rating system focused on multifamily buildings, that includes the topic of durability and resilience, as the ability of the built environment to deal with high-risk phenomena such as earthquakes, flooding and climate hazards reducing the severity of damage to structures.

GBC ITALIA SUSTAINABILITY CERTIFICATION PROTOCOLS

GBC Condomini[21]

To meet specific market requirements, Green Building Council Italia is designing a new protocol, called Protocollo Condomini (Rating system for multifamily buildings), dedicated to the renovation and management of multi-family buildings in the framework of sustainability. An important aspect of innovation and uniqueness is represented by the thematic area called Durability and Resilience which contains criteria to analyse a series of risk factors to which the building and its occupants can be subjected. In this thematic area, reference is made to the in-force regulations on safety (seismic, fire prevention, hydrogeological, etc.) urban planning and similar building regulations.

These elements allow:

- to assess the risk to which the building and its occupants may be subjected due to external factors (earthquakes, floods, landslides, etc.) or internal risks (structural problems, fire risk, etc.);
- to preliminarily define the interventions to contain any risks and evaluate the costs necessary for their realization.

With regard to the activities of management and maintenance after building works, the protocol, in the thematic area Energy and Atmosphere, introduces the concept of real performance of intervention evaluation.

GBC Home[22]

GBC Home is a protocol designed for small and large residential buildings, from single-family buildings to condominiums up to 10 floors, which may also include a small part intended for non-residential functions, such as offices and commercial activities. The protocol was developed specifically considering the housing characteristics and the differences in the constructive model of the Italian reality, inspired by the LEED protocol. This rating system promotes health, durability, economy and best environmental practices in the design and construction of buildings.

GBC Historic Building[23]

GBC Historic Building is a voluntary certification protocol dedicated to sustainable conservation, renovation, recovery and integration with different uses of historic buildings.

To be eligible for the protocol application, the building must have been built before 1945 for a portion of at least 50% of the existing technical elements.

The applicability in Italy is therefore very wide. In fact, according to the ISTAT data, more than one fifth of the existing residential buildings (26%) was built before this date. The protocol can be applied also to major renovations, intended as interventions that involve relevant elements of the air conditioning systems, the renewal or functional reorganization of the interior spaces, the possibilities of improvement of the building envelope, saving aesthetic, typological and constructive characteristics of the existing building.

GBC HOME V2
Checklist

Nome progetto:
Data:

Y	?	N			Punti	Perf. Esempl.	P/C
0	0	0	**Sostenibilità del Sito**				
Y			Prereq 1	Prevenzione dell'inquinamento da attività da cantiere	Obbl	No	P/C
			Credito 1	Selezione del sito	4	No	P
			Credito 2	Vicinanza ai servizi collettivi e mobilità alternativa	3	Sì	P/C
			Credito 3	Gestione del sito	3	No	P/C
			Credito 4	Acque meteoriche e massimizzazione spazi verdi	4	Sì	P/C
			Credito 5	Effetto isola di calore	4	Sì	P/C
			Credito 6	Aree comuni: spazi di relazione e spazi comuni	2-4	Sì	P/C
0	0	0	**Gestione delle Acque**				
Y			Prereq 1	Riduzione del consumo di acqua potabile ad uso domestico	Obbl	No	P/C
			Credito 1	Riduzione del consumo di acqua potabile ad uso domestico	2-7	Sì	P/C
			Credito 2	Gestione efficiente dell'acqua a scopo irriguo	2-5	No	C
0	0	0	**Energia e Atmosfera**				
Y			Prereq 1	Prestazioni energetiche minime degli edifici	Obbl	No	P/C
			Credito 1	Ottimizzazione delle prestazioni energetiche degli edifici	4-22	Sì	C
			Credito 2	Produzione in sito di energia da fonti rinnovabili	2-8	Sì	P/C
			Credito 3	Elettrodomestici	1-2	No	C
0	0	0	**Materiali e Risorse**				
Y			Prereq 1	Gestione del ciclo dei rifiuti	Obbl	No	P/C
			Credito 1	Riutilizzo di elementi strutturali e non strutturali degli edifici	1-3	No	C
			Credito 2	Gestione dei rifiuti da demolizione e costruzione	1-2	Sì	C
			Credito 3	Certificazione multicriterio	2-4	Sì	C
			Credito 4	Ottimizzazione ambientale dei prodotti	3	Sì	C
			Credito 5	Materiali estratti, lavorati e prodotti a distanza limitata	1-2	Sì	C

Y	?	N			Punti	Perf. Esempl.	P/C
0	0	0	**Qualità Ambientale Interna**				
Y			Prereq 1	Controllo delle contaminazioni generate dalle attività umane	Obbl	No	P/C
			Prereq 2	Protezione dal radon	Obbl	No	P/C
			Credito 1	Sistemi di ventilazione e controllo dell'umidità	1-5	No	P/C
			Credito 2	Qualità dell'aria indoor in fase di costruzione	1-2	No	C
			Credito 3	Materiali a bassa emissione	1-3	Sì	C
			Credito 4	Luce naturale	1-2	Sì	P
			Credito 5	Acustica	2-3	No	C
			Credito 6	Bilanciamento delle reti di distribuzione	5	No	C
0	0	0	**Innovazione nella Progettazione**				
Y			Prereq 1	Manuale operativo per il locatario	Obbl	No	C
			Credito 1	Manuale di Gestione e Manutenzione	1	No	C
			Credito 2	Innovazione nella Progettazione	1-4	No	P/C
			Credito 3	Professionista Accreditato GBC HOME AP	1	No	P
0	0	0	**Priorità Regionale**				
			Credito 1	Priorità regionale	1-4	No	P/C
0	0	0	**Totale**		110		

Base: 40-49 punti, **Argento**: 50-59 punti, **Oro**: 60-79 punti, **Platino**: ≥80 punti
(+ punteggio incrementale)

Checklist of credits for the assessment of the sustainability of residential buildings.

CONCLUSIONS

The national building stock is ageing and was largely built before the law 373/76, the first law on energy efficiency, therefore in Italy building renovation has a large market.

National policies for several years have introduced tax deduction for energy efficiency measure and building renovation. Private finance could propose solutions that can integrate these schemes. An example could be mortgages. The mortgage market is also growing at national level, especially in the northern regions. Taking advantage of the reduction of building management costs (such as the reduction of the energy bills) a subsidized loan or mortgage based on energy efficiency criteria could find fertile ground for implementation.

The national energy cadastre is available in 14 Italian regions and contains data on the APE and thermal plants. To compensate for this deficiency, existing databases or demonstration tools that express, for each building typology, standard energy demand and the potential for energy saving achievable with shallow and deep energy saving measures. However, Italian case studies demonstrate that an energy audit is necessary to understand the real potential for energy savings. Furthermore, in order to start operations and guarantee performance over time, detailed assessments of building scale and ad hoc management contracts are recommended for the duration of the mortgage.

The case studies launched in Italy demonstrate how private financial tools are economically sustainable for all stakeholders when a certain number of buildings participate in the renovation process.

To fully exploit the impacts of energy requalification both on management costs and on the value of the property, other related benefits (eg improvement of comfort) must be considered as well, and the related indicators identified.

GBC Italia has developed three sustainability assessment protocols for residential buildings, GBC Condomini, GBC Home and GBC Historic Buildings, specific for the national building stock, which, in terms of energy performance evaluation, provide in-depth analysis compared to simple APE. Furthermore, this protocol takes into account specific aspects such as the evaluation of structural conditions and of building envelope materials, and as other sustainability rating systems, user behavior and indoor comfort requirements that could be taken into account to establish the value of the building before and after renovation works.

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EeMAP
Energy efficient Mortgages Action Plan

Green Building Council Italia

With the support of the World Green Building Council's Europe Regional Network

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