

# Green loans experiences as investment multiplier schemes

Sergio Zobot  
Province of Milan  
Corso Porta Vittoria, 27  
20122 Milan, Italy  
s.zobot@provincia.milano.it

Carlo Monguzzi  
Via Castel Morrone 4  
20129 Milan, Italy  
monguzzi.carlo@gmail.com

Gianluca Ruggieri  
DASS – Università dell'Insubria  
via G.B. Vico 46  
21100 Varese, Italy

## Keywords

financial incentives, subsidies, market development, local or regional energy efficiency measures, green lease, third party financing

## Abstract

In recent years Italian national and regional governments have been active in promoting energy efficiency and renewable energies. The most effective measures are focused on the residential sector: feed-in tariffs for photovoltaic systems (higher tariffs for building integrated small plants), 55 % tax credits for energy efficiency investments (windows or boilers substitutions, walls and roof insulations or even complete building refurbishments).

Recent surveys show that in some cases the customers are informed but cannot afford to pay for the needed investments and they prefer not to ask for loans, paying interests. In this situation the final customer may decide to opt for low quality refurbishments, not necessarily affecting the building energy consumption.

For these reasons there can still be some room left for some local supporting initiatives. In the Province of Milan the Mutuo A-profitto provided green loans with no interest to the consumers to all those who want to perform an energy efficient refurbishment of their house:

- local banks provided the third party financing
- interest were paid half by the bank itself and half by the province administration
- the project designer or the installer had to declare the expected energy savings

In this way the customer obtained an interest-free loan up to 7 years: since the amount of the instalment could not exceed the amount of the expected economic savings, even the annual cash flow will be positive. Eligible measures include: glaze substitutions, walls and roof insulation, heating systems, solar water heater, heat pumps.

Since 2007, the Milanese Province administration has provided 1,35 million Euro funding, which mobilized 16 million Euro of total investments. The Piedmont Region has recently introduced a similar scheme addressed to households and companies.

The paper provides an in depth description of the schemes adopted in Milan, an evaluation of the results and a comparison with the Piedmonts' experience and the "éco-prêt à taux zéro" (zero interest green loans) recently introduced in France by the Ministère du Développement Durable.

## Introduction

As previous analysis suggested (Ruggieri G., Dall'Ò G., Galante A., 2007, and 2008), when analysing energy efficiency markets for residential sector, different barriers may be identified:

- Overestimation of additional costs by final beneficiary;
- Lack of information by the final customer about existing supporting schemes;
- Difficult access to credit;
- Lack of interest and knowhow on energy issues from the credit institutions;

- Overestimation of credit risks faced by the credit institutions;
- Lack of interest from the craftsmen and the building companies to maximize achievable potential savings;
- Vocational inertia of technicians: all possible innovations run the risk of being considered just another source of complication;
- Lack of mutual trust between different actors.

Unfortunately no magic wand is available to anyone intending to promote energy efficiency: no single measure can achieve the whole potential of energy savings. It is however essential to design mutually supportive packages of measures. In recent years Italian national and regional governments have been active in promoting energy efficiency and renewable energies, trying to overcome the highlighted barriers. The most effective measures focused on the residential sector are: feed-in tariffs for photovoltaic systems (with higher tariffs for building integrated small plants), 55 % tax credits for energy efficiency investments (including windows or boilers substitutions, walls and roof insulations or even complete building refurbishments).

Previous incentive schemes, based on subsidies, resulted to be less effective, because they were not designed to promote the effectiveness of the interventions. For example the 10.000 Photovoltaic roofs programme consisted of 70 % subsidies for the installation of small PV applications (Aste, N., Adhikari, R. S. and Tagliabue, L. C., 2007). This scheme resulted in an artificial increase of the costs rather than in the multiplication of efficient installations (EUROSERV'ER, 2005). The incentives were provided on a one-off scheme and there was no control of the real situation after the installation was completed. On the contrary the feed-in tariffs promotes the efficacy because the incentive is provided over twenty years, proportionally to the measured electrical production.

Regarding the tax credit, many installers and designers do not introduce the support scheme to their customers because they do not know about them or they think that they are too difficult to manage. In some cases they also wish to avoid declaring their work so that they would not pay income taxes and offer discount to their customers to avoid producing official invoices. Recent surveys (collected in CRESME-ENEA, 2010) show that less than 10 % of the households that performed interventions claimed the 55 % tax credit. Among those who have not taken advantage of it, 38,6 % did not know anything about this possibility and 16,2 % had bureaucratic problems. In other cases the customers are informed but cannot afford to pay for the needed investments and they prefer not to ask for loans, paying interests.

In this situation the final customer may decide to opt for low quality refurbishments, if necessary, not affecting the building energy consumption. For these reasons there can still be some room left for some local supporting initiatives.

Regional Governments and other local authorities in Italy typically promote energy efficiency and renewable deployment in the residential and commercial building sectors through subsidies schemes. Procedures are rather complex and time consuming. Given the administrative costs of handling each dossier, only very large intervention may be supported (oth-

erwise for one intervention the administrative costs may be higher than the subsidy). In most cases, the average amount of public subsidy for building refurbishments may vary between 100.000 Euro and 200.000 Euro per intervention. Therefore only a limited number of large interventions can be promoted (Sachero, 2011). Direct subsidies may provide 30-50 % of the total costs of the intervention, thus obtaining a multiplying factor of 2 or 3 maximum.

In this paper we will present and discuss the green loans experience in the Province of Milan where the multiplying factor was 11,8. The green loan scheme acted in a market where other instruments were already active and can be therefore considered as an accompanying measure. The scheme was designed in order to overcome some of the identified barriers, in particular the difficult access to credit and the lack of mutual trust between different actors. The implementation process helped local financial institution to estimate more appropriately the financial risks and constitute a real incentive to deal with energy.

### Milan Province energy action plan

In 2005 the Province of Milan launched the Programme for Energy Efficiency committing itself to reduce the final consumption of primary energy in the industrial and residential sectors by 35.000 toe per year. At that time the Province of Milan included 189 municipalities and almost 4 million inhabitants (1,3 million living in the Milan municipality). Later it split into two different provinces, but this paper refers to the previous situation.

The energy department of the Province promotes action on energy efficiency and technological innovation, not only to reduce costs for families and businesses, but also to revitalize the framework of small and medium-sized enterprises and services that has always been the backbone of the Milanese economy.

Since 2005, various operative tools have been studied and created, aimed at drastically reducing the final consumption of fossil fuels and, as a result, at minimising air pollution. This has been achieved mainly by setting up working groups including several administrators and technical experts from the municipalities in the Milanese area, as well as the main economic, social, and financial stakeholders, and ultimately by signing mutual agreements.

In 2005 a study was commissioned to the IEFÉ-Bocconi (Institute for the economy of energy sources – University Bocconi). The Evaluation plan of energy efficiency costs and measures in the Milan Province published in early 2006 (Lorenzoni A., Cattarinussi M., 2006) served as a scientific foundation for the Energy Efficiency Action Plan, developed in late 2006. The Action Plan is based on three main pillars:

#### 1. Regulations, certification and inspection on buildings.

The drawing up of New Building Regulations, aimed at halving energy consumption in new and refurbished buildings; the adoption of Building Energy Certification for greater awareness of energy consumption and market transparency; and the establishment of an Accreditation System for Building Certifiers in order to guarantee that “Certifiers” are qualified and independent. The Boiler Inspections arise directly from an institutional competence transferred to the Provinces in 1993 by the State, well before the 2002/91/EC

Directive. This is still considered the best tool to increase the energy efficiency of heating plants and boilers.

2. **Information, communication and education.** The administration created the InfoEnergia, a Network of Energy information desks, which is intended to be a way of bringing the Province of Milan closer to the public. These are easily accessible, located in busy streets of different municipalities. The information desks ensure that information on energy efficiency and assistance are readily obtainable, and also publicise and encourage energy efficiency through regular meetings dedicated to specific issues and/or technologies. Training sessions are also held on the rational use of energy in the home. 46 InfoEnergia information desks have been opened so far. The 4 main information desks are open daily in order to provide the public with a permanent reception area in fixed locations, while there are 42 information desks open 2-4 times per month in smaller municipalities.
3. **Financial Incentives.** Since new and fully refurbished buildings represent only 3 % a year of the building stock, a financial scheme has been set up to address individual energy efficient refurbishment: this paper will focus mainly on the results of the financial scheme, although it benefited from the integration of the other two instruments.

## “A-Profitto” green loans

### PREVIOUS EXPERIENCES IN NORTHERN FRANCE

In 2005 the Conseil Régional Nord Pas de Calais has developed a green loan project for insulation measures addressed to households built before 1982 (Lafolie B., 2005). The scheme was organised to be as simple as possible. A performance threshold was defined for the U-value of the windows ( $U=1,5 \text{ W/m}^2\text{K}$ ) and for the thermal resistance of the insulation ( $R=5,5 \text{ m}^2\text{K/W}$  for pitched roofs, insulation placed between rafters;  $R=3,0 \text{ m}^2\text{K/W}$  for flat roofs, floors and walls). Two different instruments were developed: Isolto (maximum costs 20 Euro/m<sup>2</sup> only for roof insulation) and Isol+ (maximum costs 50 Euro/m<sup>2</sup> for complete insulation). Tariffs for the refurbishment works were defined in advance in accordance with the local craftsman associations.

The region launched a call for tender targeting banks with the objective to stimulate the competition between banks to make the best possible use of public money. Two different banks applied to the call, one proposing loans with a fixed interest rate, the other one preferring a floating rate. The experience of the fixed rate served as a model for the Italian experience.

The Isolto fixed rate was 2,90 % half of which was offered by the bank, the remaining half by the regional council, creating a free of interest loan for the beneficiaries. The loan amount could range between 750 and 6.000 Euro. If more money was needed for the intervention, the customer could be granted a complementary loan with normal market interest rates. Isolto loans may last between one and seven years, were given out without any other charge and without guarantee or mortgage.

The scheme was effective in terms of simplicity, but suffered some problems. One major critical point was the fact that the bank, after the acceptance of the request, paid the contribution directly to the craftsman (or the building company), and not to

the customer. In this way, a direct link between the customer and the bank was missing, whereas, in order to maximize the efficacy, the final beneficiary of the project should be the central figure of the scheme.

For this reason, one of the main differences between Isolto and A-profitto was that the Province of Milan preferred to choose the citizen as the central figure of the mechanism. There was no definition of refurbishment tariffs, but just a cap to the total investment that could be financed.

### THE A-PROFITTO SCHEME

The Province of Milan launched a discussion with financial actors early 2006. The scheme of A-Profitto was developed through a participative approach. Earlier relationships were already established with two local banks. When the general proposal was ready, meetings were organised with the main banks active in the Province (around ten different institutions accepted to participate). The more interested financial stakeholders were the local Credit Unions (Banche di Credito Cooperativo). These banks, although autonomous, are part of the same network and typically are active on a local basis only in some municipalities, normally not overlapping their zones of influence. In this way they do not compete but rather they tend to cooperate and in some case they may agree on similar strategies.

The preparation process took one year. One of the issues that needed to be clarified (by the budget department of the province) was to decide whether the costs had to be considered as an investment (therefore in the capital expenditure line of the budget) or as an interest (and therefore in the current expenditure). Finally the budget department was convinced to consider it as an investment.

A call for proposal was addressed to banks that were interested in participating in the process. The technical annexes specified most of the technical rules and some of the economic conditions. The Province provided 300.000 Euro. The Banks interested to participate should propose a budget request and specify the interest rate they intended to offer to the final beneficiaries. In order to define the ranking order, the Province would have chosen the better economic conditions.

Single person as well as co-owners in condominiums could benefit from the loans. In case of co-owners, the condominium manager would ask for loans only for those owners who needed it. While the procedure would be common, the loan would be conceded to each co-owner. Eligible measures included:

- The insulation of roofs, attics and terraces
- Walls insulation
- Replacement of windows or installation of double or triple glazing
- The substitution of single family heating (or cooling) systems with centralised systems, including control systems
- The renovation of the building heat distribution system including thermoregulation
- Replacement of heating generation systems including thermoregulation

- Solar collectors for domestic hot water or for low temperature space heating
- Ground source heat pumps for low temperature space heating systems
- Photovoltaic grid connected applications up to 20 kW

The Province of Milan launched the first call in November 2006. The call was addressed to the banks active within the province. Two Credit Unions participated to the first call, proposing the same conditions and, in early 2007, the first loans were available to the final customers.

Figure 1 shows the complete flow chart of the A-profitto scheme that is described in the following paragraphs.

The proposed loans were based on a fixed rate of 5 %: 2,5 % was offered by the bank, the remaining 2,5 % was directly paid by the Province Energy Department. Market rates were normally around 6-7 % at that time. But banks accepted lower rates because this kind of intervention was considered free of risks (we will focus on the benefits for banks in following paragraphs). Maximum amount was 50.000 Euro. Loans could not exceed 7 years. Instalments had to be paid twice a year.

No mortgages were asked, and no other fees had to be paid; the loan is a so-called “chirographary”, meaning that the customer’s signature is enough to acquire the loan.

The beneficiaries had to prepare all the documents needed for the loan application. The Infoenergia information desks supported the citizens that were interested on technical issues, the bank offices were responsible to hand out financial information.

The beneficiaries could freely choose the craftsman or building company that would have carried out the intervention. The appointee had to prepare a quotation and to declare the expected energy savings results of the intervention. This declaration served as a barrier for craftsmen or companies that do not work professionally.

The loan application had to be submitted to the bank. An Evaluation Team was established for each bank participating in the project. The team included one representative from the bank (who chaired the team), one from Infoenergia and one from the Province administration. First of all the bank evaluated the request from a financial point of view. If the customer was considered to be eligible, then the Infoenergia would evaluate the technical aspects of the application: adopted technologies, expected savings and energy certification, if necessary. The Evaluation Team could accept or ask the applicant to provide more documents.

As soon as the Evaluation Team accepted one proposal, the Province administration paid in advance its full share of interest costs due to the bank (e.g. half of the total). The Province preferred this solution because otherwise its contribution would have been paid every six months causing extra costs as each payment has its administrative costs. In addition, since the money in the Province budget was already allocated to this project, it turned out that paying all in advance would be cost effective for the Province, and well accepted by the bank.

After the loan was granted, the craftsman or the company should finish the installation and deliver the technical documentation certifying the completion of the works within six months. If the deadline was not met then the beneficiary

should pay the first instalment including a 5 % interest, and only after the completion of the work, the bank would have paid the interest back. This procedure, combined with the on-site inspections, has prevented people from obtaining a zero interest loan for expenses unrelated to energy efficiency measures. Inspections were carried out in at least 20 % of the buildings, randomly.

#### **Benefits for the customer and for the bank, costs for the province**

Thanks to this approach, the customer can obtain:

- Information on the national support schemes (tax rebates and feed-in tariffs) provided by the InfoEnergia offices;
- Assistance during the preparation of the application: this is probably one of the critical success factors;
- An interest free loan, so that even low income families can decide to perform energy refurbishment of their house;
- A declaration of the craftsman carrying out the work, estimating energy savings, and to some extent, taking responsibility for the actual results.

The A-profitto scheme was designed so that costs of energy upgrading could be “painless” for families. This means that the bill reduction resulting from the intervention must be equal to (or higher than) the investment needed. For this reason, the loan instalments have to be lower than, or equal to the savings obtained on bills, estimated in the declaration of the professional included in the application.

Why would the bank accept to finance half of the interests? First of all, they felt that if the compliance of the procedure was assured, then they would not suffer from bad loans (or would suffer less than usual). The bank can also benefit from a commercial viewpoint, providing a new service to its customers or, to some extent, gaining new customers. Furthermore, since the Province would pay in advance its part of interests, the financial analysis was quite positive from the bank perspective.

Banks participating in the project were concerned that the procedure was followed precisely because this would assure that all the actors involved were aware of their rights and duties. In this way financial risks would be minimised, giving them the possibility to accept a lower interest compared to other types of loans.

As already noted, the financial actors that were more active in this project were local Credit Unions. These banks are a part of a network and normally coordinate their financial offers. For these reasons, when in 2007-2008 the market rates decreased, they remained at a 5 % interest level.

The costs for the Province were quite limited, since the only real direct expense was half of the loan interest. Administrative costs, such as the personnel costs of the Infoenergia information desks have not been estimated. In any case these can be considered as negligible, since Infoenergia is mostly economically autonomous, through its paying services.

#### **Learning process**

The A-Profitto scheme was introduced in 2006 resulting in a total of four calls for proposal until 2009. It was the first experience of publicly supported energy efficiency loans active in Italy. The following section will show and discuss the number of par-

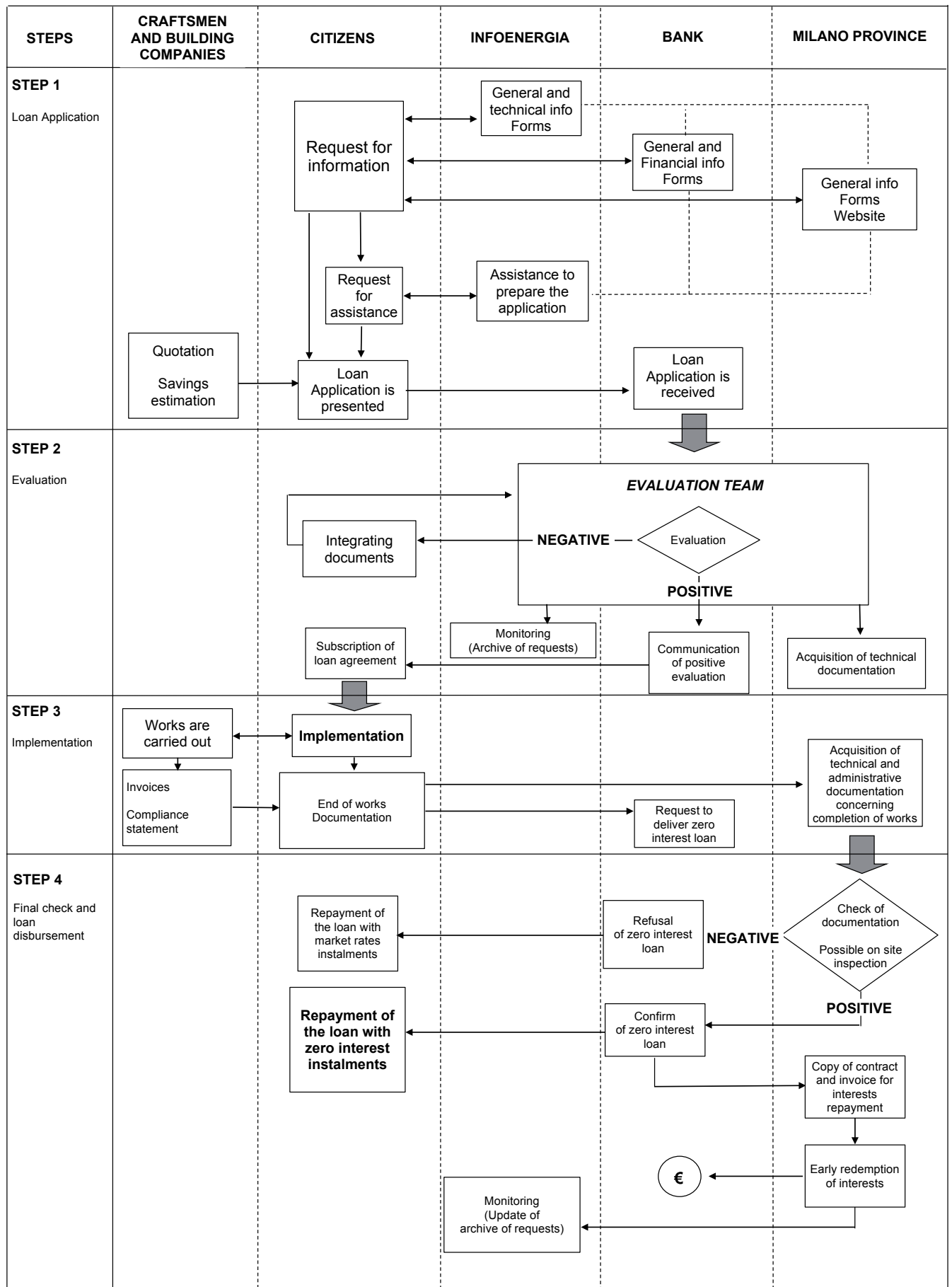


Figure 1 – Flow chart of the A-profitto scheme.

ticipants, energy savings, and Euros invested, while we first analyse the lessons learned during the experience, which allowed some parts of the scheme to be changed in order to overcome unexpected problems that arose during the first years.

1. The declaration estimating expected energy savings was a critical issue. In the beginning no one was willing to prepare and sign it. Some of the installers asked the province to change the procedure. Then, thanks to the collaboration and support of the Infoenergia desks, the first craftsmen started to be more confident and were ready and willing to prepare it. As already said, the declaration served as a support to the beneficiaries. The rationale behind it is *not* to estimate exactly the actual savings, because they may vary depending on the behaviour of the beneficiaries.
2. After the first call, the Infoenergia opened a desk inside one of the bank branches. Infoenergia personnel were in charge of preparing the applications on the behalf of the applicants. When the number of applicants increased, it turned out that this was too complicated and onerous for the Infoenergia. Furthermore it took away the responsibility from the citizen, endangering the whole process. In later calls the Infoenergia offered support, but the responsibility was clearly on the applicant.
3. The local Credit Union, by statute, may only act in the municipality where they have a branch, and in the neighbouring ones. In the first calls, only Credit Union participated, therefore not in all the municipalities within the Province were citizens offered an A-profitto loan. The Province had to contact and convince other banks (that could act in all the municipalities) to take part in the project, so that all the citizens of the Province were offered the same options. The Province started new contacts with other banks to convince them to participate and in the final call, a bank that was active on the whole territory of the Province actually participated.
4. In some cases, the citizens included in the application also costs that were not directly linked to the energy savings intervention. For example, when considering external wall insulation, after the intervention it may be necessary to paint the façade, to move the gutters, to change the windowsill, the window framework or to perform other small alteration of the façade. The Province policy was to accept all these kind of costs (including scaffold costs) without verifying if they were really necessary or not. This choice derived from the general approach adopted by the Province, that preferred to set up a simple framework avoiding long lasting procedures and discussions that would have resulted in higher administrative costs.

### End of the experience in 2009

The last call for proposal was prepared in January 2009. Interventions were financed throughout 2009. The experience was judged very positively by the Province administration.

The experience came to an end because in January 2010 the National taxes department decided that regional or provincial schemes (like Zero interest green loans) could not be applied to interventions that already benefit from other national contributions (like tax credit, see following paragraphs).

## Evaluation of the programme: strengths and weaknesses

The energy savings results of the project discussed in this paragraph are based on the declarations collected through the applications. For this reason, it can be possible that the energy savings are underestimated, since the professionals were cautious, when asked to declare the expected savings. But a different calculation of the savings based on a case-by-case evaluation was simply not possible.

Through the four calls for proposals, the Province allocated 1.350.000 Euro. Overall, by the end of 2009, the beneficiaries activated 16 million Euro investments in energy efficiency and renewable sources. One euro invested by the Province generated 11,8 Euro of private investments. The investments generate about 3 million Euro/year economic saving.

Energy saving amounts to almost 7.000 MWh/year, which corresponds to 600 toe/year or 1.500 tons/year of CO<sub>2</sub> equivalent avoided emission. During the lifetime of the installations, the total energy reduction will be up to 10.000 toe. More than 1.000 families were directly involved in the scheme, that was addressed only to the residential sector.

### ECONOMIC ANALYSIS BY TECHNOLOGY

In this section we analyse the economic performance of projects that involved single technology interventions. Actually, it was not possible to analyse projects that involved more than one technology (for example roof insulation and boiler substitution), because an *ex post* cost allocation between them would have been arbitrary. The analysis is therefore limited to 1.070.000 Euro of public contribution (80 % of the total allocated budget).

In Table 1, total expenditure, energy savings and public investment by technology during the four calls are shown. Photovoltaic applications accounted for one fourth of the applications and half of the total budget. Among other interventions, Solar Thermal applications were the least successful ones. It can be clearly seen that the Province contribution amounts to only a small fraction of the total mobilised investment (between 6 and 9 %). Total Investment includes all costs incurred by the beneficiaries: technical, administrative and financial as well as taxes (e.g. VAT). The cost of the personnel of Infoenergia and Province involved in the project is not included in the evaluation.

In Table 2 we have synthetized the economic performance of the project. We calculated the cost of conserved energy (CCE) with the formula (1):

$$CCE = \frac{I_0}{E_s} \cdot \left( \frac{R}{1 - (1 + R)^n} \right)$$

where:

CCE: Cost of conserved energy (Euro/MWh)

$E_s$ : Annual Energy savings (MWh/year)

$I_0$ : Initial Investment (Euro)

R: Interest rate

n: Lifetime of the intervention (years)

The CCE is useful to compare the total cost of the intervention with the fuel cost that is saved. The interest rate that is used for

**Table 1 – Total expenditure figures, energy savings and public investment for single technology interventions during the four call for proposal.**

Technologies	Number of interventions <i>(source: i)</i>	Total Investment <i>(i)</i>	Energy savings <i>(i)</i>	Province contribution <i>(ii)</i>
		<i>Euro</i>	<i>MWh/year</i>	<i>Euro</i>
Boilers and heating systems	246	1.096.997	1389,1	82.618
Solar thermal applications	182	449.550	350,9	38.184
Insulation	215	2.007.089	851,0	114.412
Windows	291	2.702.480	973,2	222.373
Photovoltaics application (*)	304	6.912.932	2704,3	613.110
<b>Total</b>	<b>1238</b>	<b>13.169.048</b>	<b>6268,6</b>	<b>1.070.697</b>

Sources: (i) Internal report by Province of Milan; (ii) own calculations

(\*) For Photovoltaics applications the figures include the total energy produced that is partially utilized on site (before the counter) and partially is sold to the System Operator.

**Table 2 – Average cost of conserved energy by technology during the four call for proposal.**

Technologies	Lifetime <i>(source: i)</i>	Total cost of conserved energy <i>(i) R=5%</i>	Total cost of conserved energy <i>(ii) R=0%</i>	Province contribution <i>(ii) R=5%</i>
	<i>years</i>	<i>Euro/MWh</i>	<i>Euro/MWh</i>	<i>Euro/MWh</i>
Boilers and heating systems	15	76,1	52,6	5,7
Solar thermal applications	20	102,8	64,1	8,7
Insulation	40	137,4	59,0	7,8
Windows	40	161,8	69,4	13,3
<i>Average for thermal applications</i>	<i>n-a</i>	<i>134,7</i>	<i>62,7</i>	<i>10,2</i>
Photovoltaics application	30	166,3	85,2	14,7

Sources: (i) Province of Milan, 2010; (ii) own calculations

its calculation actualises energy savings to the initial year: the hypothesis is that a kWh saved now has a higher value than a kWh saved in ten years' time.

But in the A-profitto scheme, the intervention is interest free for the beneficiaries (R=0). Therefore we also calculate the CCE putting the interest rate equal to zero, i.e. CCE is calculated as the ratio between the investment and the total energy savings (as shown in column 4 of Table 2). Finally, we calculated the CCE considering only the direct financial costs incurred by the Province (final column of Table 2).

Among thermal applications, the CCE is around 135 Euro when considering the interest rate, and 63 Euro when not considering it. For electricity applications (photovoltaics) the CCE is around 166 Euro when considering the interest rate, and 85 Euro when not considering it.

In Table 3 we also show the average fuel costs in Milan (December 2009) as comparative figures.

One interesting result is that when interests are not included in the analysis the intervention are cost effective, meaning that the Cost of Conserved energy is lower than the fuel costs. When considering the interests paid, the analysis is not so positive: some measures are cost effective, others not.

But it is important to note that between 2004 and 2009 the fuel costs have increased by around 5 % per year (estimation based on Italian Energy Authority figures, AEEG, 2010a and AEEG, 2010b). If the same would happen in the next 15 years, as shown in Table 4, we would soon end up with fuel costs higher than cost of conserved energy

The Province is happy with the result of the project. Still, some barriers are difficult to overcome:

**Table 3 – Fuel costs in Milan as of December 2009.**

Fuel costs	Euro/toe	Euro/MWh
Natural Gas	848	73
Oil	1368	118
Electricity	1860	160

Source: Province of Milan, 2010

- Training of professionals and field operators is still insufficient at all levels; it should be tackled with appropriate measures;
- Public-private partnerships like A-profitto engage Local Banks that have a better knowledge of their areas of competence thus preventing “bad loans”; public financial bodies are not used to provide loans to small customer, and have some difficulties in the risks estimations;
- There is a need to gain more participation from more Banks; the Banks still have strict internal rules and rigid administrative systems;
- Builders and component/systems suppliers, are still reticent and non-committal in giving performance guarantees on their work.

Last but not least, the time and the cost of training for staff should not be underestimated; but creating reliable and efficient “facilitators” is a long-term project, and not a waste, since it will benefit the whole system even after the end of the financial scheme. Even today, when the scheme is not active anymore, a citizen interested in an energy efficient refurbishment may ask the Infoenergia to support him on the technical aspects. Once identified some possible investment options, he

**Table 4 – Projection of fuel costs and comparison with cost of conserved energy (Euro/MWh).**

	CCE	Fuel costs	2009	2014	2019	2024
Thermal (min) Boilers	76,1	Natural Gas	73	93	118	151
Thermal (max) Windows	161,8	Oil	118	150	191	244
Electricity	166,3	Electricity	160	204	260	332

**Table 5 – Intervention under 55 % tax credit and A-profitto in the Province of Milan 2007–2009.**

Technologies	Number of interventions under 55% tax credit			Number of interventions under A-profitto		Costs of intervention
	Lombardia in 2008	Lombardia in 2007-2009	Milan in 2007-2009	Total	% of total intervention in Milan province of what?	Euro per intervention
	(source: i)	(ii)	(ii)	(iii)	(ii)	(i)
Heating systems	12.022	28.831	11.659	246	2,1%	14.080
Solar.thermal applications	3.613	8.665	3.504	182	5,2%	8.760
Insulation	1.984	4.758	1.924	215	11,2%	29.860
Windows	24.978	59.902	24.224	291	1,2%	10.142

Sources: (i) ENEA, 2009; (ii) own estimates; (iii) Province of Milan, 2010

can ask a loan to one of the banks involved in the project, that now are more used to deal with these kinds of requests than before the A-profitto started.

### Interaction with other national schemes

As stated above the two main instruments to promote energy efficient intervention active in Italy are the 55 % tax credit and the Photovoltaic feed-in tariffs<sup>1</sup>. Both can be considered as successful experiences as shown for example in CRESME-ENEA, 2010, ENEA, 2009, ENEA 2010, Photon International, 2011.

The two schemes request some initial investments, while the public contribution is provided in the following years. The potential beneficiaries that do not have the required amount of money need the intervention of a financial institution: in this perspective, A-profitto may serve as an accompanying measure, since it provides only a small amount of money (compared to what is provided by the tax credit and the feed-in tariffs).

The question is whether this additional contribution has performed properly or not: was A-profitto determining in the decisions to perform the interventions?

### 55 % TAX CREDIT

Since 2007 the Italian government adopted a tax credit scheme for energy refurbishments of existing buildings. 55 % of the total investment incurred by the ratepayer can be deducted from the total amount owed to the State for the annual income tax. Although the regulation changed through the years, the credit can be deducted in annual rates.

1. Although it would not be appropriate to simply consider a PV installation as an "energy efficient" intervention, practical experience shows that in many cases people that install a small PV start to be more aware of energy consumption patterns in a household. Furthermore, the net metering mechanism provides a strong incentive to shift their load to the hours when their installation is producing electricity. But this discussion is not the focus of this paper.

This scheme was quite successful and almost 600.000 interventions were carried out between 2007 and 2009. The total investments amount to around 8 billion Euro. Eligible measures included:

- The insulation of walls, roofs, attics and terraces
- Replacement of windows or installation of double or triple glazing
- Replacement of boilers with more efficient ones or heat pumps
- Solar collectors for domestic hot water or for low temperature space heating
- Total building refurbishment obtaining drastic reduction in energy consumption (20 % less than current legal standards)

Initially these incentives were considered cumulative with zero interest loan, until the National tax department changed approaches late 2009.

Unfortunately there is no data available on the number of intervention carried out in the Milan Province. It is possible to estimate local results based on the available data regarding Lombardia region (9,8 million inhabitants, around 40 % in the Province of Milan). The data available covers 2008 interventions: all other data presented in Table 5 are to be considered as own estimates.

Apparently the zero interest loans had a rather marginal impact, except for the insulation measures. A total of 11,2 % of the insulation measures carried out in the Province of Milan were supported through the A-profitto scheme. If A-profitto had any effect, it was for this intervention. This can be explained by the fact that walls and roof insulation are the most ambitious interventions that need a bigger investment, and generate higher savings. Furthermore, for this kind of interventions, the technical support offered by the Infoenergia can be really helpful for the energy user. The table suggests that A-profitto was probably determining in the choice of beneficiaries that, given the high



Table 6 – Photovoltaic plants supported through feed-in tariff in Italy 2007–2010.

	Class 1 between 1 and 3 kWp		Class 2 between 3 and 20 kWp		Class 3 above 20 kWp		Total	
	Number of Installations	Power (MWp)	Number of Installations	Power (MWp)	Number of Installations	Power (MWp)	Number of Installations	Power (MWp)
2007	2.186	5,6	1.197	8,5	51	4,3	3.434	18,3
2008	11.811	31,2	10.228	82,2	1.121	160,3	23.160	273,8
2009	17.065	46,1	19.446	149,9	2.308	483,8	38.819	680,0
2010	20.356	56,5	32.264	237,3	3.563	981,0	56.183	1.274,8
<b>Total</b>	<b>51.418</b>	<b>139,4</b>	<b>63.135</b>	<b>477,8</b>	<b>7.043</b>	<b>1.629,4</b>	<b>12.1596</b>	<b>2.246,5</b>

Class 1, 2 and 3 are supported with different level of the feed-in tariff.

Source: Atlasole - Gestore del Sistema elettrico (<http://atlasole.gse.it/atlasole/>)

Table 7 – Photovoltaic plants under 6 kWp supported through feed-in tariff and A-profitto in the Province of Milan 2007–2009.

		Total Feed-in Tariff	A-profitto	As percentage of total
		(source: i)	(ii)	(ii)
<b>Number of installations</b>		1.451	304	21%
<b>Power</b>	kWp	4.635	1.336	29%
<b>Average Power</b>	kWp/plant	3,2	3,4	

Sources: (i) Atlasole - Gestore del Sistema elettrico (<http://atlasole.gse.it/atlasole/>); (ii) Province of Milan, 2010

costs of insulation interventions, needed additional financial support to overcome the investment cost barrier.

#### PHOTOVOLTAIC FEED-IN TARIFFS

Since 2005 photovoltaic electricity production is supported in Italy through a feed-in tariff scheme. The reform of the mechanism approved in 2007 and the changes in the market condition have boosted the sector to over 2 GW installed, with an average +410 % yearly increase in installations as shown in Table 6.

The feed-in tariff is effective because it links the public contribution to the effective energy production. When market conditions are particularly favourable, it promotes the deployment of huge investments on bigger plants. Smaller plants suffer from higher costs (in terms of Euro/kWp) but are favoured by the net-metering mechanism that joins the feed-in tariff.

Generally the typical household photovoltaic installation is building integrated and less than 6 kWp (quite often under 3 kWp to take advantage of higher feed-in tariffs). The payback time in this case may vary between 8 and 12 years, while the supportive scheme lasts for 20 years. Those households with a well-oriented roof that does not suffer from any shading can profitably install a plant. One big barrier to this intervention can be the high installation costs: In 2007-2008, for small installations, they could generally be around 6.000 Euro/kWp, decreased to 5.000 Euro/kWp in 2009. It means that on average each household may need at least between 15.000 and 20.000 Euro to install a photovoltaic system.

Some families may find difficult to collect this sum and the A-profitto scheme can work as a tool to improve the access to credit, increasing guarantees to all the actors involved. In Table 7 we confront the total number of small plants (under 6 kWp) installed in Milano province between 2007 and 2009 with the number of plants supported by A-profitto.

The A-profitto loans have supported 21 % of the total installation in the Province territory accounting for 29 % of the total installed power. The results of the comparison confirm that A-profitto was probably determining in those interventions that

require higher capital costs, as already emerged from the analysis of the interaction with the 55 % tax credit.

#### CONCLUSIONS: A-PROFITTO WORKED WELL AS AN ACCOMPANYING MEASURE

The A-profitto scheme was introduced in a situation where other national support schemes were already active. Therefore it is not possible to analyse its result without taking account of the interactions with other scheme and it is not possible to say what would have happened if these national schemes were not active. The results of the analysis of the interactions of A-profitto with these instruments rather suggest that the zero-interest loans have probably helped to overcome remaining financial barriers, related to a difficult access to credit.

#### Similarities and differences with other green loan schemes

##### PIEDMONT EXPERIENCE

The Piedmont regional administration, following the Milanese experience has introduced a similar scheme. The main differences between the two schemes are described in Table 8.

Unfortunately, this scheme also suffered from the national Tax Department's decision that regional or provincial schemes (like zero interest green loans) can not be applied to interventions that already benefit from other national contributions (like the tax credit). The final customers normally prefer the tax credit rather than the zero interest loans, since the tax credit provides higher incentives.

No energy or financial data are available concerning the effectiveness of the scheme.

##### ÉCO-PRÊT À TAUX ZERO IN FRANCE

In 2009 the French Ministère de l'Écologie, du Développement durable, des Transports et du Logement (Ministry of Ecology, Sustainable Development, Transports and Housing) has devel-

**Table 8 – Main differences between A-profitto and the Piedmont experience.**

<b>A-profitto</b>	<b>Piedmont</b>
Refurbishment projects and photovoltaics installation are eligible	Only refurbishment projects are eligible
Only residential sector	The scheme is open also to enterprises (although for big enterprises the interests will be financed only by 50 %)
Private banks will provide the loans, and will be the only responsible for the financial transactions	Piedmont regional administration acts through its own credit company, Finpiemonte. The bank or credit institution must sign an agreement with Finpiemonte
The application must be addressed to the bank	The application must be addressed directly to Finpiemonte by the final customer)
Maximum amount for residential sector is 50.000 Euro	Maximum amount for residential sector is 100.000 Euro

**Table 9 – Main differences between A-profitto and Eco-prêt à taux zero.**

<b>A-profitto</b>	<b>Eco-prêt à taux zero</b>
No limitations is introduced concerning the age of the building	Only households built before 1990 are eligible
Refurbishment projects and photovoltaics installation are eligible	Only refurbishment projects are eligible
No performance threshold is defined: the Regional Law implementing EPBD already sets performance threshold for building refurbishments	Two options are available: (a) Integrated interventions that include at least two categories among six eligible: (1) roof insulation; (2) wall insulation; (3) windows substitution; (4) heating system substitution; integration of renewable sources in the (5) heating system or (6) in the hot water supply system; (b) Integrated interventions that achieve overall energy performance of the household under fixed thresholds: (1) 150 kWh/m <sup>2</sup> per year if the conventional consumption before work is above 180 kWh/m <sup>2</sup> per year; (2) 80 kWh/m <sup>2</sup> per year in all other situations. Thresholds are adjusted according to climatic zones and altitude
In some cases, the citizens included in the application also costs that were not directly linked to the energy savings intervention. The Province policy was to accept all these kinds of costs (including scaffold costs) without verifying if they were really necessary or not. This choice derived from the general approach adopted by the Province, that preferred to set up a simple framework avoiding long lasting procedures and discussions that would have resulted in higher administrative costs.	A detailed list of which works can be included in the financing scheme is published (for example for roof insulation, will be eligible only necessary replacement of tiles, repair of waterproofing, false ceiling if insulation is internal, and will not be eligible the rehabilitation of the frame, replacing all the tiles, install new skylights ...)
50.000 Euro maximum	20.000 Euro maximum for two categories, 30.000 Euro for three categories or intervention that achieve performance thresholds. Sum exceeding these limits can be offered at normal conditions by the bank.
Maximum 7 years	The repayment period is 10 years. It can be reduced to a minimum of three years. Exceptionally, it can be extended to 15 years with the agreement of the bank.
Infoenergia information desks help interested persons on technical issues	Espaces Info Energie (similar to the InfoEnergia network) help interested persons on technical issues
Can be combined with tax credit before 2010	Cannot be combined with tax credit before 2011 or other support instruments (given by Agence nationale de l'habitat, local authorities ...). Finally an additional loan for sustainable development may be asked under particular circumstances.

oped a national scheme for green loans (Eco-prêt à taux zero). The main differences with the Italian experience are described in Table 9.

The comparison suggests:

- The French scheme allows interaction of different instruments, with some limitations;
- The French scheme introduces performance thresholds promoting ambitious interventions in terms of energy savings
- The maximum eligible requests in Italy is almost twice as high as the French one, favouring interventions that need higher financial investments (and may suffer for difficult access to credit);
- In both scheme the loan is seen as only one part of a bigger scheme, and may be also seen as accompanying measures
- The information desks network (Infoenergia as well as Espaces Info Energie) plays an important role.

## Conclusions

When a green loan is offered to the public, it may function as a lever and reach potential beneficiaries through different promotional tools, directly in the bank offices or through media solicited by the Province administration. The presence of a third party actor (the Province administration, the Infoenergia information desks) that has no economical interests can help to build mutual trust. In this regard green loans can be appropriate tools to accompany other supportive schemes, provided that there is no legal conflict such as the interdiction to cumulate different incentives. This evidence is particularly clear when the user needs a loan to perform the intervention, while is negligible when the loan is not needed.

## References

The main author of the paper has worked to the development of the A-profitto scheme and followed directly the process and the evaluation. All information on A-profitto included in this paper derived from personal experience, except where stated.

AEEG, 2010a Andamento del prezzo dell'energia elettrica per un consumatore domestico tipo <http://www.autorita.energia.it/it/dati/eep35.htm> Retrieved March 2010

AEEG, 2010b Composizione del prezzo del gas naturale per un consumatore domestico tipo <http://www.autorita.energia.it/it/dati/gp27.htm> Retrieved March 2010

ASTE, N., ADHIKARI, R. S. AND TAGLIABUE, L. C. 2007, Evaluation of energy policies for promotion and dissemination of photovoltaic technology in Italy. *Progress in Photovoltaics: Research and Applications*, 15: 449–460. doi: 10.1002/pip.751

CRESME-ENEA, 2010, Analisi sull'impatto socio-economico delle detrazioni fiscali del 55% per la riqualificazione energetica del patrimonio edilizio esistente

EUROSERV'ER, 2005, Barometre du photovoltaïque, *Systèmes solaires* n.166

ENEA, 2009, Le detrazioni fiscali del 55% per la riqualificazione energetica del patrimonio edilizio esistente nel 2008, ENEA - Gruppo di Lavoro "Efficienza Energetica"

ENEA, 2010, Detrazioni fiscali del 55% per la riqualificazione energetica del patrimonio edilizio esistente. *Analisi degli investimenti e dell'energia risparmiata - Periodo 2007-2008*

LAFOLIE B., 2005, Mise en place d'un crédit co-bonifié pour la réhabilitation thermique de l'habitat ancien, Direction Environnement, Conseil Régional Nord Pas de Calais

LORENZONI A., CATTARINUSSI M., 2006, Piano di valutazione dei costi delle azioni di efficienza energetica nella Provincia di Milano - Rapporto FINALE IEFE Università Commerciale L. Bocconi

PHOTON INTERNATIONAL, 2011, The Italian market exceeded all expectations in 2010 – but is growth at this pace sustainable?

PROVINCE OF MILAN, 2010, I Prestiti a Tasso Zero per la riqualificazione energetica degli edifici esistenti, Internal Report

RUGGIERI G., DALL'Ò G., GALANTE A., 2007, Le barriere all'efficienza energetica nei condomini italiani - Analisi e proposte d'intervento – a project coordinated by WWF Italy

RUGGIERI G., DALL'Ò G., GALANTE A., 2008, Barriers to Energy Efficiency in Italian Multifamily Residential Sector: Analysis and Policy Proposals, 31st IAEE International Conference - Bridging Energy Supply and Demand: Logistics, Competition and Environment – Istanbul, June 18-20<sup>th</sup> 2008

SACHERO V., 2011 Valentina Sachero, private communications.