POLITECNICO DI MILANO

Scuola di Architettura Urbanistica

Ingegneria delle Costruzioni

*Management of Built Environment*

# THE VALUE OF ENERGY PERFORMANCE CERTIFICATES IN THE REAL ESTATE INVESTMENT MARKET

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# Abstract

The purpose of this dissertation is to define the premium market value of the energy performance labels in the investment Real Estate market in Italy. The Investigation has analysed the Italian real estate market after the 2008 crisis, showing how the investments started again, the Energy Performance Certificate and the most used methodologies to define a Buildings market value. Then the analysis moved forward to the legislative context, analysing firstly the European Union Directives and how they have been implemented in the Italian legislation, analysing also two foreign legislation.

Moreover, to find evidence that a premium value for more performing buildings exist in the market, have been analysed several studies and paper wrote by important authors in both European and United States context.

Then the research tried to define a model, which scope is to find the premium market value and a premium rent in the Italian Market according to different asset class and their Energy Performance Certificate. Those results had been later tested in four case studies with the use of the Discounted Cash Flow Methodology, to evaluate if really the previous results of the model could be effective. The final results shows that the model could be used to evaluate the market value of a building, both through a discounted cash flows and through a comparison approach.

L'obiettivo di questa tesi, è definire quale sia il valore, in termini monetari, fornito dalla classe energetica degli immobili a reddito nel mercato italiano. L'analisi è partita da una visione generale del mercato immobiliare Italiano, che a seguito della crisi del 2008 sta mostrando segnali di ripresa. Sono stati analizzati nel dettaglio l'Attestato di Prestazione Energetica e le metodologie di valutazione degli immobili. Inoltre è stato importante avere un preciso studio della normativa, partendo dalle direttive europee per poi spostare l'attenzione verso la normativa italiana, ritornando poi ad analizzare le normative di altri paesi europei che sono considerati fra i più avanzati in Europa per quanto riguarda le tematiche di sostenibilità.

Per cercare sostegno riguardo l'esistenza di un valore aggiunto fornito dalla classe energetica, sono stati analizzati un ampio numero di articoli, scritti da importanti esperti del settore immobiliare italiano, europeo e mondiale.

L'obiettivo finale è stato quello di definire un modello che identificasse il valore di mercato conferito dalla classe energetica, da cui ne conseguisse il valore della locazione. I risultati ottenuti sono stati analizzati in un modello cosiddetto "Discounted Cash Flow", che permette di verificarne la reale efficacia. Il modello restituendo valori congrui, permette di valutare il valore degli immobili sia attraverso il modello "DCF" che attraverso il modello comparativo.

# SUMMARY

# PICTURE SUMMARY

# INTRODUCTION

The purpose of this dissertation is to define the premium market value of the labels defined in the energy performance certificate of a building or a building unit. The energy labels are parameters that defines the energy expenses for a Building and, according to the Italian legislation, shall be provided to buyer or renter in case of sales or leasing of a building or a building unit. Those ratings in Italy are divided in 10 labels from A4, the one more performing, to G the one less performing.

The energy performance certificate of buildings is very important, not only due to the cost a buyer or renter is going to incur in a building or in a building unit but give also some important information like how to improve the energy performances of the building. In fact, has been calculated that in the European Union nearly the 40% of the consumption of energy come from residential and tertiary sector building. Moreover, European Union set a plan, known as 20 20 20, that consist in reducing emission of greenhouse gases by 20%, increase by 20% the energy produced by renewable sources and save an amount of energy equal to 20%, all that should be reached by 2020.

The analysis will focus on the typologies of assets under the category of the so-called capital market. Those assets are generally bought by investors that are not the end users, but decide to invests on an assets to lease it on the market and obtain profits. Specifically, the assets on which this analysis will focus on are: Office buildings, retail buildings and residential buildings.

Is important to underline that the analysis has been developed in the last stages of a worldwide crisis that had a huge impact on the real estate industry. Due to this reason, is necessary to understand, what can be a positive factor that may improve the value of a building not only in monetary terms, but also in timing terms.

In the first chapter the analysis will focus its attention on the context in which this work took place, by giving a general overview of the Italian Real Estate market, starting from the residential market and then moving on to the non-residential, specifically on the investment sector, this sector in Italy is rising again in the recent period. Then the attention will be focused on the Energy Performance Certificate (EPC) and a general overview of the Italian stock according to the energy performance rating in the Lombardy region real estate market. At last an analysis on the three most used methodologies to define the objective market value of the building and some consideration on which one can be used to define the value of the energy performance rating. In the second chapter will be analysed the legislative background of this thesis, starting from the European Community Directive issued in 2002, the European Union 2010 Directive, then the analysis will move into the adoption of the European legislation through the Italian legislative decree 192/2005 and the Law Decree 63/2013.

In *Chapter 3* the analysis would regard the literature developed in different market by some of the most important expert of the industry. The aim of these researches was to demonstrate if there is a correlation between the Energy Performances of buildings and the Value of the same. The aim of the analysis developed on the literature, was to understand what has been done in those market to find evidences to be later used to define a model which scope is to define the value of buildings.

In *Chapter 4*, the work focused on the development of a model which aim was to define the premium market value for buildings, the analysis started from Energy Performances, for the three asset class under analysis, Office buildings, Retail buildings and Residential Buildings. The model aim is define the today value, of future monetary savings deriving from better energy performances of a building, when comparing it to other labels. The final results, is the Present value of future savings, that has been applied in *Chapter 5*, in a discounted cash flow model to verify if the model works as expected in the *Chapter 4*.

In *Chapter 6* the work resumes what has been defined in the previous chapters, deining some :::::::

# Chapter 1

# THE CONTEXT, ANALYTICAL OVERVIEW

The aim of the first chapter is to analyse the general context in which this work took place. The chapter is divided in three main sections, the first one is an analysis of the real estate market, starting from the residential sector and then moving to the investment sector, which in the last three years is rising again. In the second section the analysis will focus on the Energy Performance Certificate, and how the stock of the Lombardy region is divided according to the energy labels. While the third sections gives a general overview of the three most common way to evaluate a building, analysing which among them could be used to define the Value of the energy performance certificate.

## 1.1 Italian Real Estate market overview

Italy, is one among the European countries that has been harder hit by the 2008 crisis. The real estate industry has been one that most suffered from that event, the effects of the crisis reached their negative peak in 2013, where prices in the residential sector dropped by 30%[1].

By looking at the data of the Italian residential Market, is possible to see that this market has been characterized over the last 50 years by a cyclical trend of grow and decline. In fact, in a time series starting from 1971 to the present, it is possible to identify 4 major cycle: 1971-1978,1978-1987, 1987-1999, 1999-present. Has been analysed that those cycle are characterized by an increased duration over time: the growth phase of the market increased from 3 to 9 years while the decline phase stretched from 7 to 4 years.

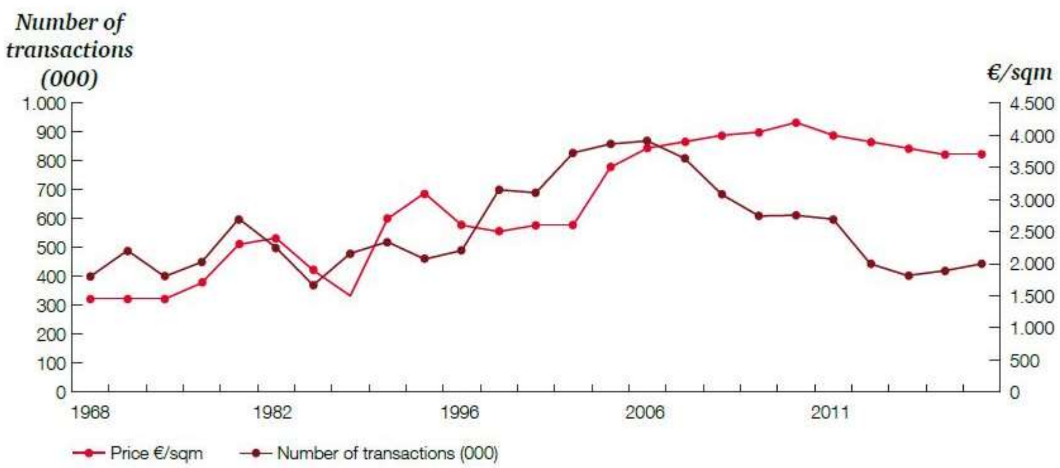


*Figure 1.1.1 Number of transactions and prices in the Italian residential sector, historical series (1968-2015); Data processing PwC.*

1 Italy Spotlight 2017, Residential real estate insight Values and sales Regional focus, Savills

By looking at the *Graph 1.1.1* [2] is possible to compare the evolution of the number of transactions (expressed in thousands) and the prices of the residential market (€/sqm). Analysing the graph right wise, at the beginning of the time series, a reduction in the number of transaction reflected its effects on prices, while in the last decade, specifically from the 2006 on where the number of transactions reached their last positive peak, the development has been different. Even if, the transactions had dramatically diminished the prices had shown lower fluctuations, keeping a more stable trend over time.

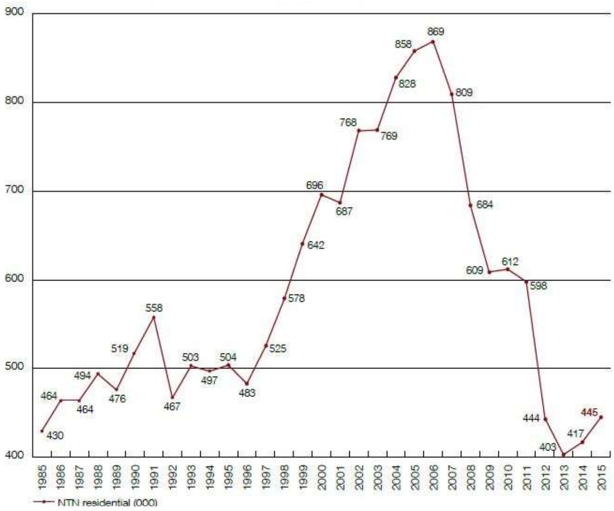

*Figure 1.1.2 Historical number of residential transactions in the Italian Market (1985-2015) Data processing PwC.*

The time series provided in the *Graph 1.1.2*[3] shows how deep the crisis of the residential sector has been in Italy, the time series analyse data from the 1985 to the 2015. As is possible to see, similar figures to the one in the graph from the 2011 on, has been registered only 20 and 30 years before the 2008 crisis, that reached its

2 Figure 1.1.1 Real Estate Market Overview Report, Italy 2016, PwC
3 Figure 1.1.2 Real Estate Market Overview Report, Italy 2016, PwC

negative peaks in 2013. Anyway, the transactions are slowly increasing again, thanks to the data provided by PwC, is possible to see that the amount of transaction registered in the residential segment in 2015.

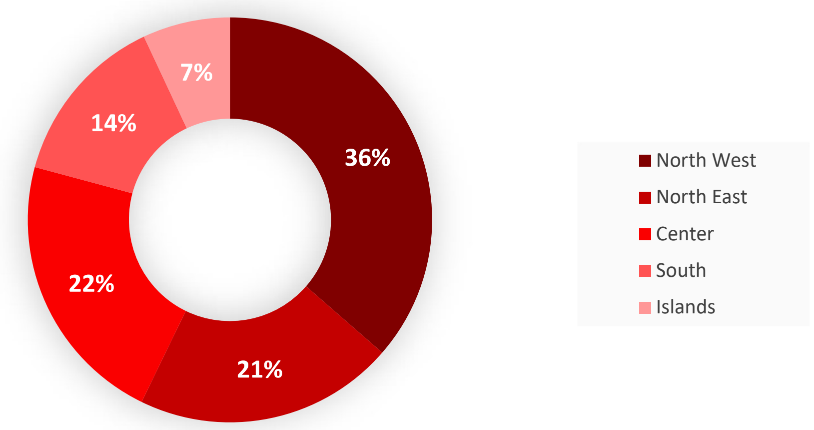


*Figure 1.1.3 Geographic Localization of residential transactions in the Italian Market in 2015; Data processing PwC*

| | **NTN IP 2015** | **Var. (%)NTN IP 2014/2015** | **Share NTN IP per area** | **Share on total NTN in 2015** |
|---|---|---|---|---|
| North West | 70.340 | 18.4% | 36.4% | 50.0% |
| North East | 40.139 | 23.2% | 20.8% | 50.6% |
| Center | 42.622 | 16.9% | 22.0% | 47.2% |
| South | 26.694 | 20.9% | 13.8% | 35.1% |
| Islands | 13.556 | 20.0% | 7.0% | 34.9% |
| **Total** | **193.351** | **19.5%** | **100.0%** | **45.5%**[4] |

4 Figure 1.1.**Errore. Solo documento principale.** Real Estate Market Overview Report, Italy 2016, PwC

*Figure 1.1.4 Number of residential transactions aggregated at regional level in the Italian market,, in 2015;Data processing PwC*

The comparison of data between 2014 and 2015 shows the continuum of a positive trend with an increase in the number of transaction, that on average increased in Italy by 20%. More than the half of the transaction registered in Italy in the 2015, are located in the northern regions[5], almost 57% of the shares. That increase in the number of transaction is due to some specific factors, one is represented by prices, that decreased during the period of the crisis. Another major reason for this increase is represented by the interest rates, that in the last 3 years started to decrease.


*Figure 1.1.5 House prices variations (existing stock and new stock) from Q1-2011 to Q1-2016; Data processing PwC*

In the *Graph 1.1.5* is possible to see the variation of prices of the residential market in a 5 years period starting from the first quarter of the 2011, to the first quarter of 2016. The analysis shows the percent price variation taking as reference the 2010. The minimum value of houses has been reached between the last quarter of 2012 and the first quarter of 2013. Since then, the trend has been positive, and the value of houses is becoming positive again.

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5 Real Estate Market Overview Report, Italy 2016, PwC

From *Figure 1.1.6*, is possible to see how the Italian market is divided in the number of transactions. As it is easy to imagine, most of the transactions involve residential typology with more than 90% of the shares, for whom concern Office, Retail and Industrial real estate transaction are less than 10% of the total number.

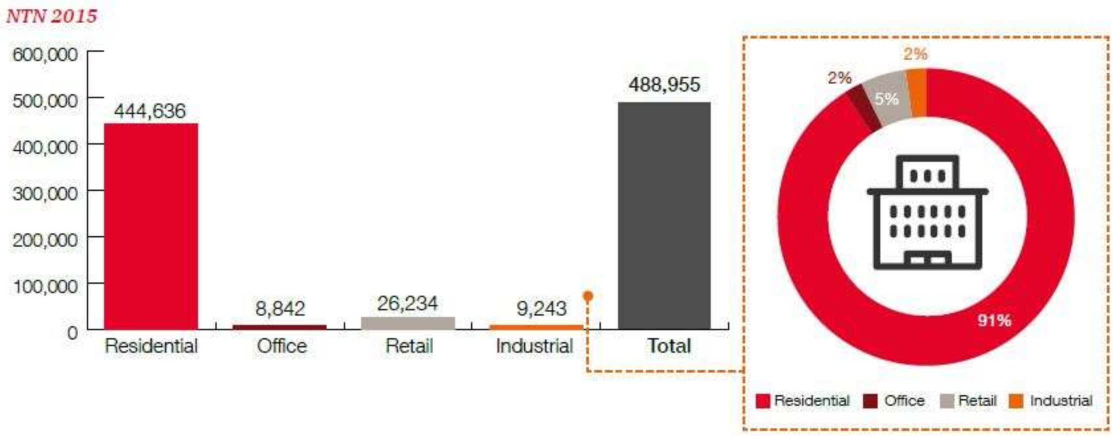


*Figure 1.1.6 Number of transaction in the Italian Market, divided by asset class, in 2015*

*Data processing PwC*

The volume of investments in the Italian real estate sector, is slowly regaining the level pre-crisis. Over the last three years there has been an increase in volume of the investment in real estate, by the so known capital market investors.[6]

As is possible to see in figure 1.1.7, the investment in 2013, recorded a total volume of around € 5 billion, that remained almost stable in 2014, just after the negative peak recorded in 2012, in 2015 the value grew by 43,9%, to a total of € 7.8 billion, while in 2016 it amounted to € 9.2 billion, with a positive increase of 19% if compared to the previous year.

6 Investment overview Q4 2017, Gabetti Property Solutions

The growth of real estate investments in Italy continued in 2017, reaching a volume of approximately € 11.1 billion, that showed an increase of 20.8% if compared to 2016.

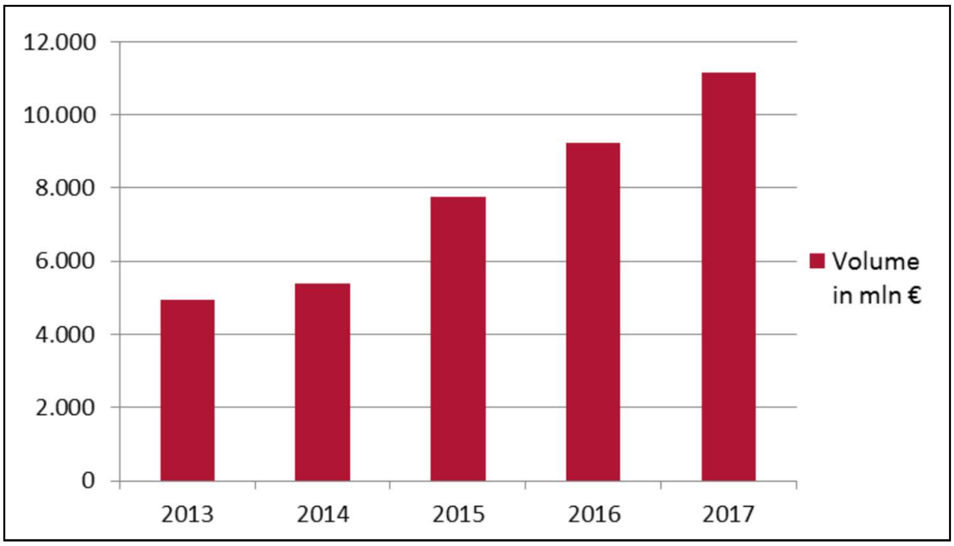


*Figure 1.1.7 Real Estate Capital Market investment in Italy 2013/2017*
*Data Processing: Ufficio Studi Gabetti*

As described before 2017, has been a positive year for the Italian market, where has been recorded a total investment volume of € 11.1 billion. [7] Figure 1.1.8 shows how the 2017 investment has been allocated in the market. The largest share has been recorded in the office sector, with a total value that amounted to approximately € 4.15 billion. Following offices sector the second largest shares involved retail sector, which represents 17.6% of the total amount, nearly € 1.97 billion. The industrial, composed mainly by light industrial buildings, logistics buildings and warehouses, represented about 11.4% of the shares, with € 1.27 billion invested. The hotels sector, with € 1.18 billion, accounted for 10.6% of the total investment. Mixed-use properties or mixed

7 Investment overview Q4 2017, Gabetti Property Solutions

portfolios, with € 1.08 million, accounted for 10.2% of the total volume, and are mainly composed by offices and retail buildings.

Investments in the healthcare / nursing home sector, with a volume of € 277 million, accounted for 2.5% of the total, while the residential sector only recorded 0.8% of the shares, with € 90 million. Lastly, the properties used for other purposes (consisting mainly of power stations, land and cinemas), with € 1.14 billion, accounted for 10.2% of the total.

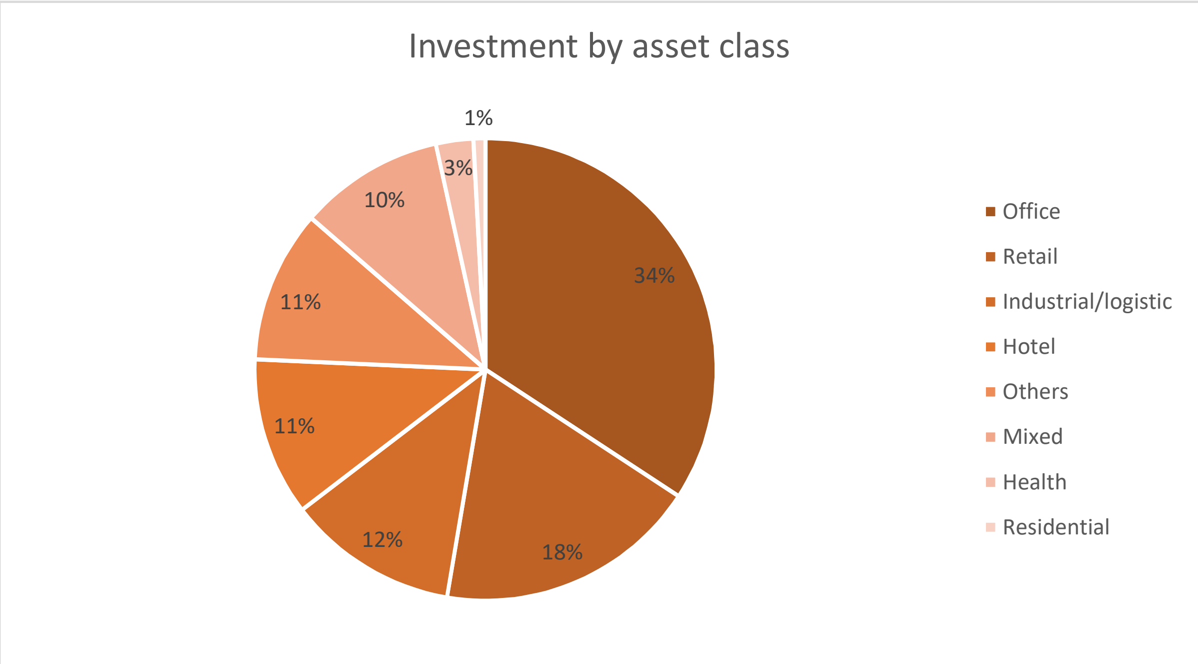


*Figure 1.1.8 2017 Real Estate Capital Market Investment in Italy divided by Asset Class*

*Data Processing: Ufficio Studi Gabetti*

Figure 1.1.9 and 1.1.10 cluster the investments by the geographical area where they mainly took place. Dividing the 2017 investments by geographical areas is possible to see that they mainly took place in the Northern part of Italy (49%). The Center follows with around 15% and the South with 5% of the total. The remaining 31% is composed of portfolios spread throughout the country. The two markets where most of the investments are still taking place are the two Italian prime markets, represented by

Milano and Roma. Specifically, the volume of investments registered in the province of Milan collects the 34.5% of the national total; while the province of Rome the 12.9%.

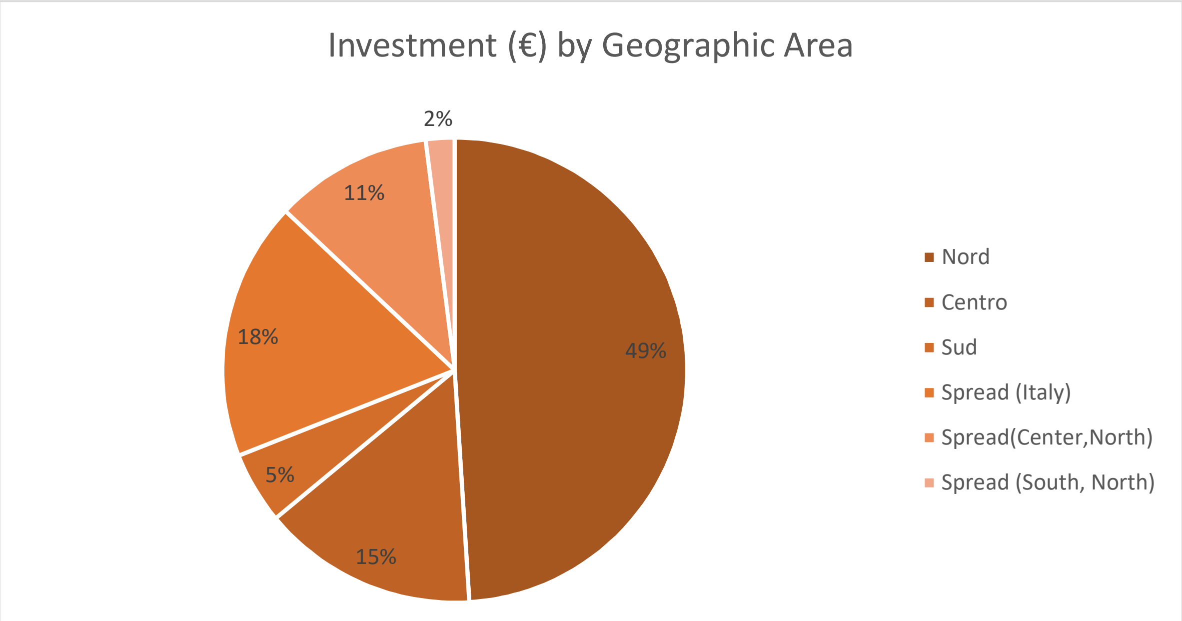


*Figure 1.1.10 2017 Real Estate Capital Market Investment (in €) in Italy divided by Geographic area*

*Data Processing: Ufficio Studi Gabetti*

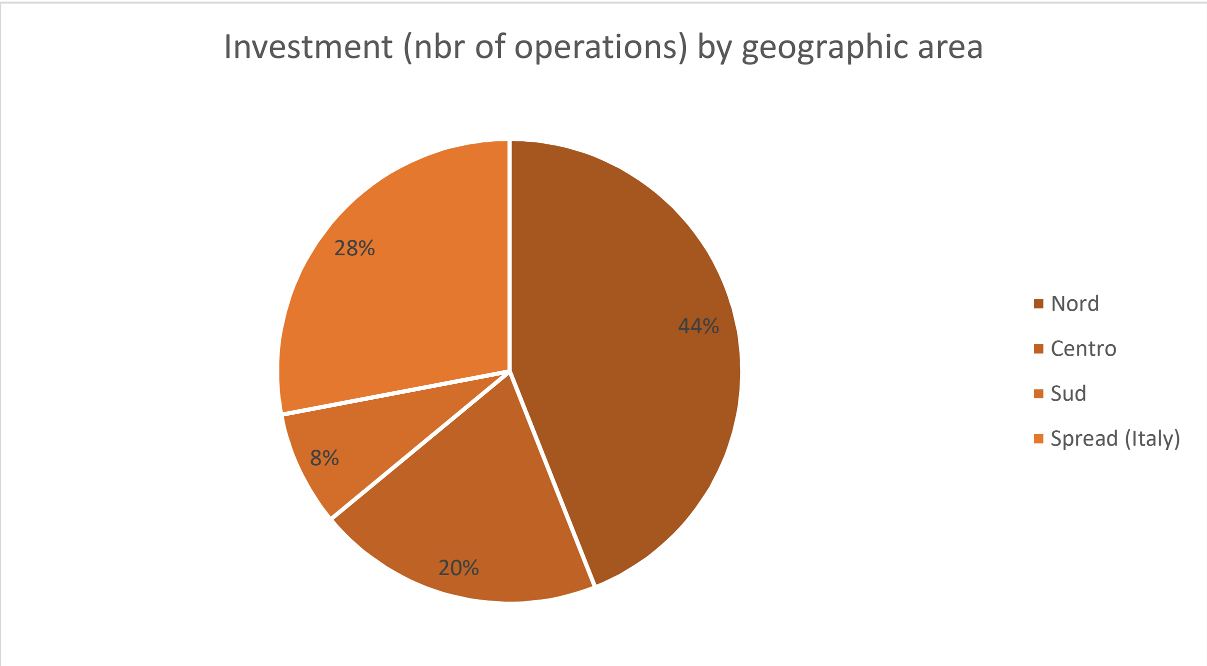


*Figure 1.1.9 Real Estate Capital Market Investment (in nbr of operations) in Italy divided by Geographic area*

*Data Processing: Ufficio Studi Gabetti*

In absolute terms, in the province of Milan has been invested a total of € 3.85 billion, while in the province of Rome has been invested a total of € 1.44 billion.[8]

North of Italy is not only the area with largest volume invested but is the area with the higher number of operations, equal to 44%, followed by the Centre with 20% and South (8%). Around 28% is not attributable to a single area, but to spread portfolio.

As discussed in the previous paragraphs, the office market investments reached a value near € 4.15 billion. The largest volume invested, attributable to a single region has been registered in Lombardy (55.6%of the total - around € 2.3 billion). Lazio follows with € 974 million 23.5% of the shares.

The list of the largest investment of 2017 in the Office sector is summarized in Figure 1.1.11:

| **Period** | **City** | **Price (€ mln)** | **Buyer** | **Seller** |
|---|---|---|---|---|
| **2017 Q2** | Rome | 510 | Tristan Capital, York Capital, Feidos, DeA Capital SGR | Scarpellini Group - Milano 90 |

8 Source: Ufficio Studi Gabetti Property Solutions.

| | | | | |
|---|---|---|---|---|
| **2017 Q1** | Spread | 316 | Ardian RE - Fondo AREEF 1 ITALY REIF, Prelios SGR | Prelios SGR - CLOE Fondo Uffici |
| **2017 Q4** | Milan | 272 | DeA Capital - Fondo Ippocrate | Edison |
| **2017 Q2** | San Donato Milanese | 180 | Kryalos sgr - Fondo Pegasus (York Capital Management) | Unicredit leasing |
| **2017 Q3** | Milano | 150 | Allianz Real Estate | Blackstone Real Estate Partners Europe |

*Figure 1.1.11 The five Largest Investment in Italy in Office sector in 2017*

Data Processing: Ufficio Studi Gabetti

The second largest assets class of investments is retail that in 2017 reached a total value of € 1.97 billion.

The largest volume has been registered in Lombardy the 37.6% of the total, nearly € 740 million, and in Emilia Romagna the 12.4% of the shares- 244 millions of €. Piedmont follows as the third largest market with 6.8% - 134 million € and Lazio (5% - € 98 million).

The list of the largest investment of 2017 in the ratail sector is summarized in Figure 1.1.12:

| **Period** | **City** | **Price (€ mln)** | **Buyer** | **Seller** |
|---|---|---|---|---|
| **2017 Q2** | Rimini | 244 | Union Investment (gruppo DZ Bank) | Fondo Cs Euroreal, Credit Suisse |

| | | | | |
|---|---|---|---|---|
| **2017 Q1** | Milan | 220 | CBRE Global Investors | Sviluppo Immobili Milano Centro |
| **2017 Q4** | Spread | 120 | Savills Investment - Fondo High Street Retail | RES, Beni stabili |
| **2017 Q2** | Milan | 83 | Svim San Babila SpA - DRC European | Red Circle San Babila S.r.l. |
| **2017 Q3** | Milan | 82 | BMO REP (pan-European retail fund) | Kering Group (MI) |

*Figure 1.1.12 The five Largest Investment in Italy in Retail sector in 2017*

Data Processing: Ufficio Studi Gabetti

## 1.2 THE ENERGY PERFORMANCE CERTIFICATE

The Energy Performance Certificate, EPC, is a document that describe the energy characteristic of a building or a building unit. The Energy Performance Certificate, EPC, has been introduced in the European Community through the directive 2002/91/EC and then modified through the Directive 2010/31/EU. In Italy the process of implementation of the European directives started in 2005 with the Legislative Decree 192, then modified by Law Decree 63/2013. Those laws, will be analysed in detail in *Chapter 2*. The Energy Performance Certificate used today in the definition of the energy performances of buildings has been developed through the Ministerial Decree 26/2015.

In Italy, the Energy Performance Certificate of a building or building unit is divided in a range of ten labels, from A4 to G. A building with the lowest consumption of energy is labelled as A4, while the highest consumption, so a poor energy performance, is labelled as a G building. The EPC, in Italy is called "Attestato di Prestazione Energetica - (APE)". The "Attestato di Prestazione Energetica" is a document drafted in case of selling or renting of a building or building unit, by a qualified and independent expert. The energy performance of a building is expressed through an index, defined by law as "$EP_{gl,nren}$[9]" but in Italy is more often called "Indice di prestazione energetica (IPE)", this index is expressed in kWh/sqm per year. The energy performance index should keep into account different factors:

a) Winter heating installation;
b) Summer conditioning installation;
c) Hot water supply installation;
d) Mechanical ventilation installation;

[9] EP= Energy performances; gl= Global; nren= non- renewable

e) Artificial lighting installation;

f) Installation dedicated to the movement of person or goods (mainly elevators);

Installation intended for artificial lighting and movement of goods should be kept in consideration at the moment of draft of the APE for the sequent case of building, according to the definition given by the DPR 412/92:

-E.1: category of Residential Buildings, only colleges, religious houses, prisons and barracks;

-E.2: building dedicated to offices;

-E.3: buildings dedicated to hospitals or clinics;

-E.4: buildings used for recreational or cult activities and similar

-E.5: buildings dedicated to business or commercial activities;

-E.6: buildings dedicated to sports activities;

-E.7: building dedicated to instruction activities.

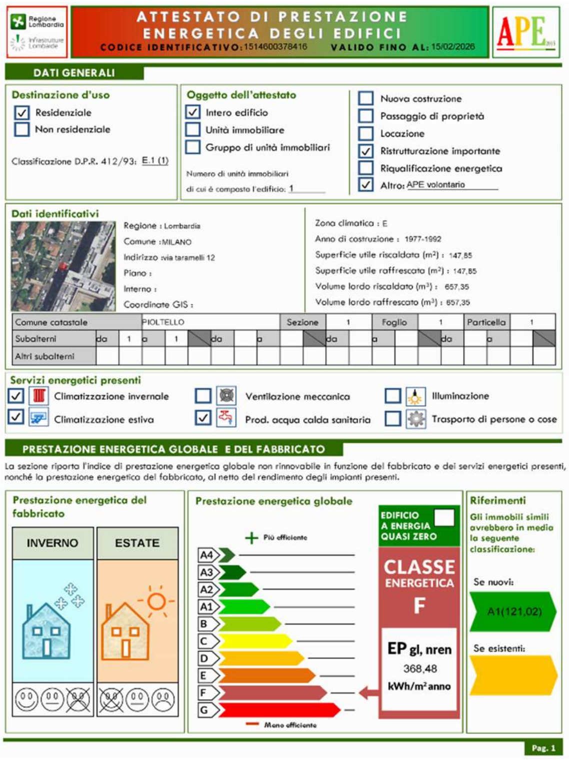


Figure 1.2.2 Italian EPC sample (APE) actually in use in Italy from 2015


Figure 1.2.1 Italian EPC sample (APE) no longer in use in Italy from 2015

Figure 1.2.1 and 1.2.2 shows the two-different samples of the Energy Performance Certificate, Figure 1.2.1 represent the new Model adopted by Italian legislation after the Ministerial Decree 26/2015, while Figure 1.2.2 represent the previous model no longer in use in Italy.

As is possible to see from the sample of an APE, most of the information concerning the building are contained in it, such as the intended use of the building (residential, commercial, offices etc.), the reasons for whom the APE is being drafted (selling, renting, new construction etc), and all the cadastral information to give the possibility to find the building in the cadastral registers.

The Ministerial decree 26/2015 defines the national guideline for the energy performance certificate and the development of a common national information system for the management of the EPC.

The Energy Performance certificate following the European directive has a period of validity of 10 years from the draft, but in case of major renovation or renovation of elements that could modify the performances should be updated, those specific are shown in Figure 1.2.3. The APE, should be drafted by a qualified expert, it should contain the quantity of energy used both for winter heating and summer conditioning and the improvement proposals for the building. The expert should visit the building or the building unit at least once, to find or verify data to correctly draft the EPC[10].

Every region or autonomous province should verify at least the 2% of the APE annually drafted. The Italian legislation specify that those control shall verify first the EPC with a higher class, in particular, it should verify: documents and the procedure, the results and the visit to the building[11].

After the 2015 Ministerial Decree, has been instituted in Italy the SIAPE "*Sistema Informativo sugli Attestati di Prestazione Energetica*" which basically represent a

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10 Art. 4 MD 26/2015
11 Art. 5 MD 26/2015

database whose mission is gather data about the energy performance certificates and simplify the controls. SIAPE should have the possibility to interact with other national database like the land registry. Actually the regions that has developed a more structured information system, are: only Lombardy, Aosta Valley and Veneto.

There are some specific mandatory cases in which an APE shall be drafted that are described in *Figure 1.2.3*:

| | | |
|---|---|---|
| New building | New building construction | Whole building |
| Integral building renovation Replacement | Demolition and total reconstruction of an existing building | Whole building |
| New building Building renovation | Works involving an extension of the gross volume of the existing building (> 15% or> 500mc) extension of existing plants | Unit under intervention |
| | Works involving an increase in the gross volume of the existing building (> 15% or> 500mc) new plants | Unit under intervention |
| Building renovation Extraordinary maintenance Restoration and conservative restoration Crawl space recovery | Recovery of an existing volume with the installation of new systems | Unit under intervention |
| | Recovery of an existing volume with the extension of existing plants | Unit under intervention |
| Building renovation Extraordinary maintenance Restoration and conservative restoration | Works involving > 50% of the gross dispersing area of the building | Whole building |
| Building renovation | Works involving a demolition and reconstruction that intervenes on> 50% of the gross dispersing area of the building | Whole building |
| Newly built building Building renovation | Works involving <15% <500 mc but> 50% of the dispersing surface | Whole building |

| | | |
|---|---|---|
| Building renovation Extraordinary maintenance Restoration and conservative restoration ordinary maintenance | Works involving > 50% of the gross dispersing area of the building without interventions to the thermal system | Unit under intervention |
| | Works involving > 25% <50% of the gross dispersing area of the building with or without interventions to the thermal system | Unit under intervention |
| Building renovation | Works involving > 25% of the gross dispersing area of the building | Unit under intervention |
| Newly built building Building renovation | Works involving <15% <500 mc but> 25% of the dispersing surface | Unit under intervention |

*Figure 1.2.3 Cases in which is mandatory to draft and EPC.*

## 1.2.1 Energy Performance Certificate labels

As already described in the Italian legislation the EPC is composed by ten energy performance labels, the lowest energy performance represent a G labelled building or building unit while the highest energy performance is rated as A4.

The previous Italian legislation about EPC, was divided in two parts, the first considered a scheme for the winter heating *Figure 1.2.4* was composed by just eight classes divided according to the building energy performances in terms of energy consumption kWh per year, the second one *Figure 1.2.5* was related only to summer conditioning, with the same 8 labels but through different parameters.

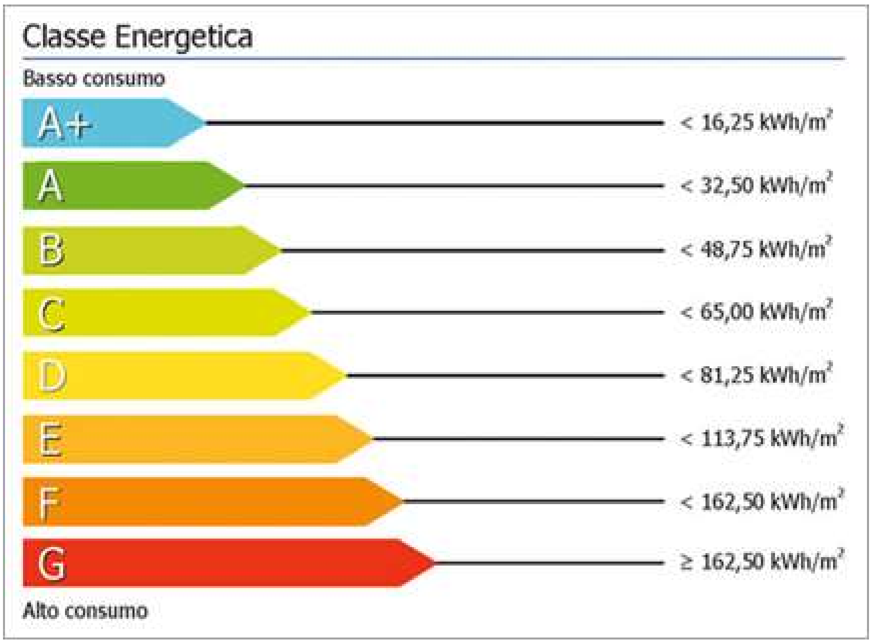


*Figure 1.2.4 Energy performance labels for winter heating in EPC before 2015*

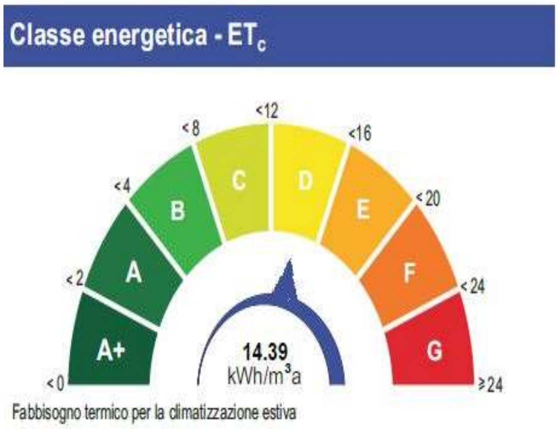


*Figure 1.2.5 Energy performance labels, for summer cooling in EPC before 2015*

In the new legislation, parameters for energy ratings has changed, in fact, the energy consumption is no longer defined as a fixed number to define the Energy Performance Certificate Ratings, but is a parameter calculated on the base of the so called reference building. See *Figure 1.2.6*

| | | |
|---|---|---|
| | Classe A4 | $\leq 0,40\ EP_{gl,nren,rif,standard}$ |
| $0,40\ EP_{gl,nren,rif,standard} <$ | Classe A3 | $\leq 0,60\ EP_{gl,nren,rif,standard}$ |
| $0,60\ EP_{gl,nren,rif,standard} <$ | Classe A2 | $\leq 0,80\ EP_{gl,nren,rif,standard)}$ |
| $0,80\ EP_{gl,nren,rif,standard} <$ | Classe A1 | $\leq 1,00\ EP_{gl,nren,rif,standard)}$ |
| $1,00\ EP_{gl,nren,rif,standard} <$ | Classe B | $\leq 1,20\ EP_{gl,nren,rif,standard)}$ |
| $1,20\ EP_{gl,nren,rif,standard)} <$ | Classe C | $\leq 1,50\ EP_{gl,nren,rif,standard}$ |
| $1,50\ EP_{gl,nren,rif,standard} <$ | Classe D | $\leq 2,00\ EP_{gl,nren,rif,standard)}$ |
| $2,00\ EP_{gl,nren,rif,standard} <$ | Classe E | $\leq 2,60\ EP_{gl,nren,rif,standard)}$ |
| $2,60\ EP_{gl,nren,rif,standard} <$ | Classe F | $\leq 3,50\ EP_{gl,nren,rif,standard)}$ |
| | Classe G | $> 3,50\ EP_{gl,nren,rif,standard)}$ |

*Figure 1.2.6 Energy performance labels after the Ministerial Decree 26/2015*

Is important to specify that, the parameters of the reference building are not fixed, but constantly updated, and vary according to the installation present in the building according to the climate area.

A pratical example was defined by Cened:

-a real building which EPgl, nren is equal to 50 kWh/sqm per year

-a reference building which EPgl, nren, rif is equal to 100 kWh/sqm per year

By dividing the energy performance of the real building with the energy of the reference building (50 kWh / sqm per year / 100 kWh /sqm per year) a we obtain a reference number that is 0,5. By looking at *Figure 1.2.6* the number 0,5 represent a Class A3 building.

### 1.2.2 Energy Performance Certificate, a general overview in the Lombardy Region

In Lombardy region, data about the EPC are collected by the information system developed by CENED " Certificazione Energetica degli Edifici" that is a technical body, controlled by the Lombardy Regional Government. The main role of CENED is mainly linked to Energy Performance Certificate, it basically verifies the EPC, provide technical support and had created the EPC registry. In the CENED registry are contained data about the EPC of the Lombardy region. As is possible to see from figure 1.2.7 most of the building or building unit, in the Lombardy region are labelled as G.

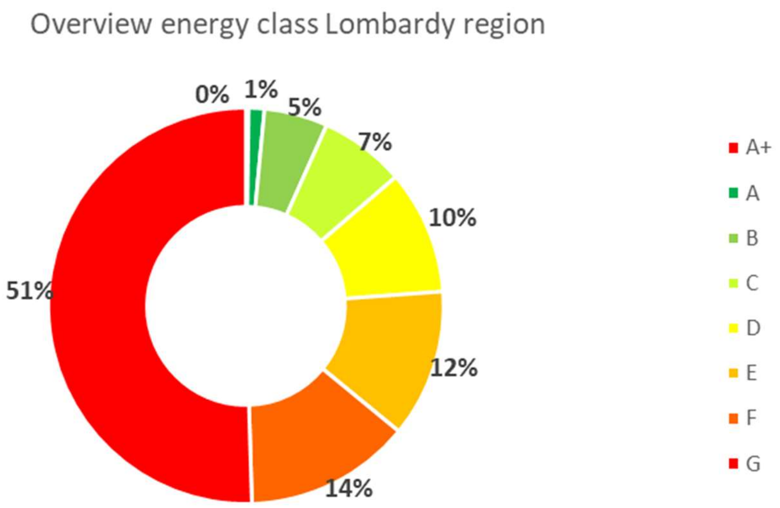


*Figure 1.2.7 Overview of the Energy performance rating in Lombardy region - Data source: CENED*

The number of EPC gathered by CENED is quite large, in fact those data consider more than 1.500.000 certificates. As we can see 51% of the EPC drafted are rated as G and just less than the 7% is in a label equal or major than B. By considering the disaggregated data, the less performing province in Lombardy region is Pavia with almost the 65% of its building in G label and less than 5% rated equal or major than B

(A+; A; B). The one highly performing is Bergamo with less than 39% of its building rated as G and more than 11% in a label equal or major than B (A+; A; B)

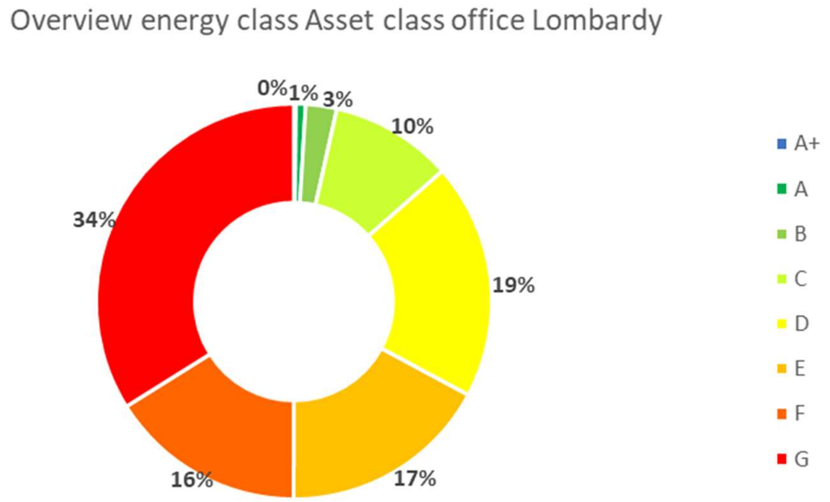


*Figure 1.2.8 Overview of the Energy performance rating in Lombardy, in office buildings*
*Data source: CENED*

In figure 1.2.8 are represented data coming from the Energy Performance Certificate for the Office asset class in the Lombardy region. Differently from the general overview, we can see that only the 34% of the EPC are in G label, while more than the 50% of the EPC are in a label equal or major than E. The data gathered for the analysis of the office sector are nearly 79.000 EPC, almost the 5% of the total.

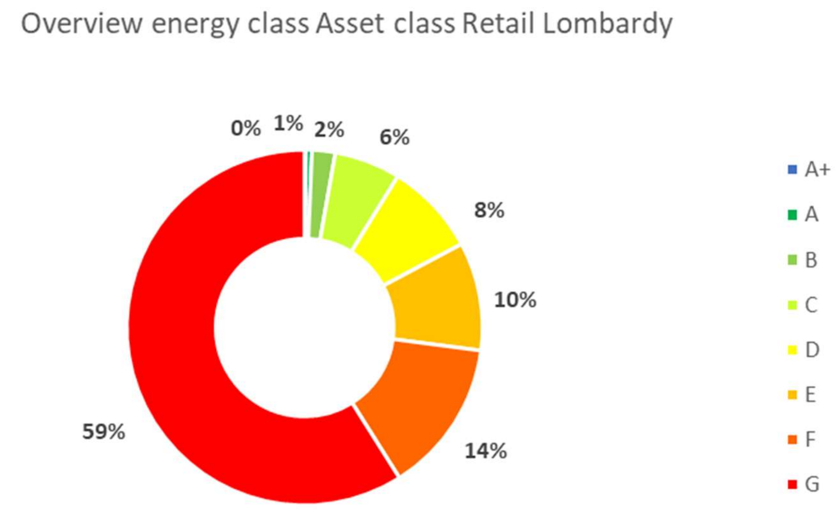


*Figure 1.2.9 Overview of the Energy performance rating in Lombardy, in retails buildings*
*Data source: CENED*

In figure 1.2.9 are represented data for Retail asset class in Lombardy region. Also in this particular case the data gathered represents nearly the 5% of the total amount with a total number of Energy Performance Certificate gathered equal to 77.000. In this case the energy performance for retail building are lower, in fact almost the 59% of building or building unit certificated are rated as G.

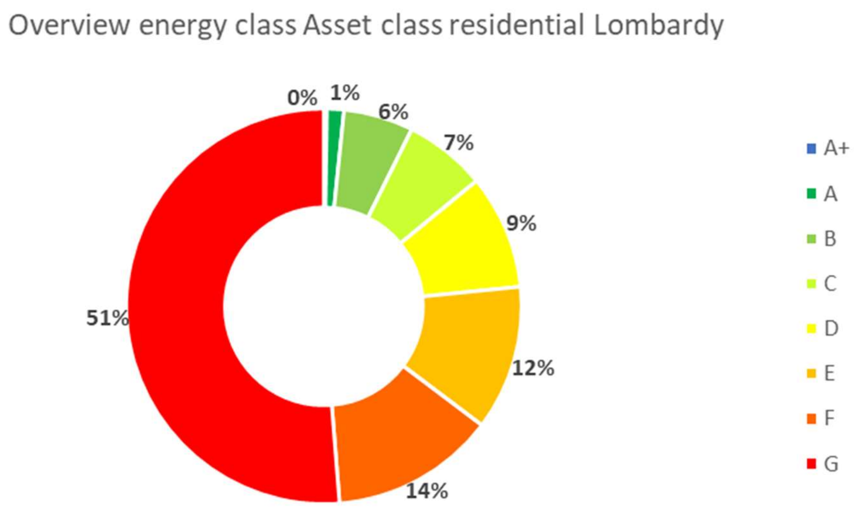


*Figure 1.2.10 Overview Energy performance rating in Lombardy - CENED*

In figure 1.2.10 are represented data for Residential asset class in the Lombardy region. As is very easy to imagine, and as was described in *Chapter 1.1*, this asset class represents the one with the higher number of transactions so the one with the higher number of Certificate drafted. Data gathered by CENED are more than 1.250.000, nearly the 85% of the total amount. As we can see, the overview for this asset class reflects almost equally the observation for the whole region.

As is possible to see, almost the half of the Lombardy region Real Estate market is composed by buildings labelled as G, among a million and half observation, just one hundred thousand are rated B or higher. This data gives some important information, in fact after different European Union Directives such as 2010/31/EU new buildings should be constructed pursuing the nearly zero energy concept, or as is happening in Denmark all the new buildings or buildings unit subject to major renovation should at least be labelled B to gain the permit for use.

## 1.3 THE EVALUATION OF BUILDINGS

In the evaluation discipline, exist three main techniques to evaluate a building or a building unit. The first is the Market methodology, based on the market comparison approach, the second is the financial methodology, based on the capitalization approach and by the analysis of the cash flows and the third one in the cost approach, where the value of a building is determined by the construction cost.

The one more common and more used in the field is the market comparison approach. The Market Comparison Approach "MCA", start from the assumption that, the value of a property can be evaluated by using the so-called comparables, property already sold on the market, which have similar characteristic to the one under analysis (location, size, floor, rooms etc). This methodology is one of the most used appraisal technique applied typically to define the value of one building or building units, using the value of other similar property, those similar property, or so called comparables should be the more possible similar to the one under analysis. This methodology is typically applied in the evaluation of residential property.

Another very common methodology is the income approach, which is typically used for non-residential building, this evaluation technique starts from the idea, that the value of a Property can be determined by dividing the income the property generate by the capitalization rate. $V_b=R_b/I$ where:

- V is the value of the property;
- R is the income generated by the property;
- I is the capitalization rate.

In particular the capitalization rate, is a very important element in fact, it keep into consideration very different elements, like the location, WAULT of the contract, the occupancy rate. In fact, due to its financial nature as indicator in some textbook the cap rate is referred as yield. Together with this methodology the analysis is deepen with a Discounted Cash Flow analysis (DCF), that allow to consider the financial point of view of the investors, which consider also the time value of money over time.

The last methodology is the cost approach, where the value of a property can be defined as the price to build or restore the property. In fact, according to this method a buyer is not willing to pay for a property more than the price he should pay to build it.

Ref

[http://www.certificato-energetico.it/certificazione-energetica.html]

[PwC RE Market report ITALY 2016]

[Savills Spotlight 2017 ITALY]

[Gabetti Investment Overview Q2 2017]

[Colliers Report Italy Investment Q3 2017]

[Deloitte The Italian real estate market]

[Cened – Building Energy performance class]

# Chapter 2

# LEGISLATIONS

This chapter will focus its attention on the legislation that had defined the energy performance certificate. The analysis will starts from the European legislation, and will in particular analyse the Directive 2002/91/EC, the Directive 2010/31/EU and the main differences among the two. Then the analysis will move on into the Italian implementation of the European Directive, by analysing the 2.2.1 Legislative Decree 192/2005, then the European Court of Justice Decision of the June 13th 2013 and at last the Law Decree 63/2013, and Law 90/2013. The last analysis of the *Chapter 2* will be an analysis on the Danish and Dutch legislation which can be considered two among the "best-in-class" countries when speaking of sustainability.

## 2.1 EUROPEAN LEGISLATION

The legislation that first had define the rule about the Energy certification for Building is a European Directive, in particular, it was the Dir. 2002/91/EC. As is stated in the TFEU and before in the TEC: “Environmental protection requirements must be integrated into the definition and implementation of the Union's policies and activities, in particular with a view to promoting sustainable development.” Another element that required the European Commission to act is the esteem provided in the consideration number (6) of the Dir. 2002/91/EC that states: “The residential and tertiary sector, the major part of which is buildings, accounts for more than 40 % of final energy consumption in the Community and is expanding”.

Moreover, the Directive took into account that the calculation technique for the efficiency of the building had to consider different regional characteristics and the different features of the building such as the type of plant for the winter heating, summer conditioning and the building shape. To satisfy these requirements the Directive bring to light the necessity to create a role of a qualified or accredited expert[12].

Another consideration [13] highlighted the necessity in case of construction of new building or for the renovation, it’s important that those building are constructed or maintained following specific rules to meet minimum energy performance requirements tailored to the local climate.

*Reference*

*-Dir.2002/91/EC*

*-Consideration 6 2002/91/EC*

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12 Consideration 10 2002/91/EC
13 Consideration 12-13 2002/91/EC

*-Consideration 10 2002/91/EC*

*-Consideration 12 2002/91/EC*

*-Consideration 13 2002/91/EC*

### 2.1.1 Directive 2002/91/EC

In the first article of the Directive are clearly defined a list of objectives in which we can find: to develop energy certification of buildings to promote energy performances and together with this objective develop a general framework for a methodology of calculation of the integrated energy performance of buildings.

The energy certification of a building has been defined in the 2002 norm as: a certificate recognised by the Member State or a legal person designated by it, which includes the energy performance of a building calculated according to a methodology based on the general framework set out in the Annex[14]. The energy performance of a building is defined as "the amount of energy actually consumed or estimated to meet the different needs associated with a standardised use of the building, which may include, inter alia, heating, hot water heating, cooling, ventilation and lighting. This amount shall be reflected in one or more numeric indicators which have been calculated". This numeric indicators must take into account important elements of the construction, which are: insulation, technical and installation characteristics, design and positioning in relation to climatic aspects, solar exposure and influence of neighbouring structures, own-energy generation and other factors, including indoor climate, that influence the energy demand[15].

The energy performance certificate must be provided in the following case: new construction, sales and rent. The energy must be provided for the owner or for the

14 Art. 2 Dir.2002/91/EC
15 Art. 2 Dir. 2002/91/EC

buyer or renter and has a validity of 10 years. Some specific categories of building wouldn't require the energy performance certification such as: buildings and monuments officially protected, buildings used as places of worship and for religious activities, temporary buildings with a planned time of use of two years or less, industrial sites, workshops and non-residential agricultural buildings with low energy demand and nonresidential agricultural buildings which are in use by a sector covered by a national sectoral agreement on energy performance, residential buildings which are intended to be used less than four months of the year and stand-alone buildings with a total useful floor area of less than 50 m2 [16].

Art. 11 states that certification of buildings, must be carried out in an independent manner by qualified and/or accredited experts[17].

In the Dir. Is not clear the meaning of 'major renovation' in fact, is only discussed in the initial consideration. In Consideration 13 we can read: 'Major renovations are cases such as those where the total cost of the renovation related to the building shell and/or energy installations such as heating, hot water supply, air-conditioning, ventilation and lighting is higher than 25 % of the value of the building, excluding the value of the land upon which the building is situated, or those where more than 25 % of the building shell undergoes renovation.' Anyway this is only an initial consideration and has not been specifically written with other definitions in Art. 2 of the directive, as has been done in the new Directive 2010/31/EU[18].

The annex set the general framework to develop the calculation methodology of the energy performance of buildings, giving the aspect that has to be considered by single Member State, at national or regional level.

16 Art. 7.1 Dir. 2002/91/EC Art. 4.3 Dir. 2002/91/EC
17 Art. 11 Dir 2002/91/EC
18 Consideration 13 Dir. 2002/91/EC

ANNEX

General framework for the calculation of energy performance of buildings (Article 3)

1. The methodology of calculation of energy performances of buildings shall include at least the following aspects:

a) thermal characteristics of the building (shell and internal partitions, etc.). These characteristics may also include air-tightness;

b) heating installation and hot water supply, including their insulation characteristics;

c) air-conditioning installation;

d) ventilation;

e) built-in lighting installation (mainly the non-residential sector);

f) position and orientation of buildings, including outdoor climate;

g) passive solar systems and solar protection;

h) natural ventilation;

i) indoor climatic conditions, including the designed indoor climate.

2. The positive influence of the following aspects shall, where relevant in this calculation, be taken into account:

a) active solar systems and other heating and electricity systems based on renewable energy sources;

b) electricity produced by CHP;

c) district or block heating and cooling systems;

d) natural lighting.

3. For the purpose of this calculation buildings should be adequately classified into categories such as:

a) single-family houses of different types;

b) apartment blocks;

c) offices;

d) education buildings;
e) hospitals;
f) hotels and restaurants;
g) sports facilities;
h) wholesale and retail trade services buildings;
i) other types of energy-consuming buildings.

[ANNEX Dir. 2002/91/EC]

*Reference*
*-Art. 1 Dir 2002/91/EC*
*-Art. 2 Dir 2002/91/EC*
*-Art. 4.3 Dir 2002/91/EC*
*-Art. 7.1 Dir 2002/91/EC*
*-Art. 11 Dir 2002/91/EC*
*-Annex Dir 2002/91/EC*

### 2.1.2 Directive 2010/31/EU

The European Union in 2010 approved a new directive in the interest of clarity because the 2002 Directive has been amended. One of the main reason that required this change was the new target set by the European Union which was the reduction by 20% of the energy consumption by 2020.

The main objective of the new Directive is identical to the Directive 2002/91/EC, in fact it aims to promote the energy efficiency of buildings within the Union, taking into account the different conditions: outdoor climatic, indoor climatic requirements and cost effectiveness. The directive remarks the necessity to develop a methodology for calculating the integrated energy performance of buildings and building units, differently from the directive 2002/91/EC the Annex I of the new directive has been developed more in details, but according to Art. 3 the methodology has to be adopted at national or regional level. Differently from the previous norm, the Dir. 2010/31/EU focus more the attention on the concept of 'cost-optimal level' means the energy performance level which leads to the lowest cost during the estimated economic lifecycle. In the definitions, Art. 2, we can read what cost-optimal level means:

- "the lowest cost is determined taking into account energy-related investment costs, maintenance and operating costs (including energy costs and savings, the category of building concerned, earnings from energy produced), where applicable, and disposal costs, where applicable; and
- the estimated economic lifecycle is determined by each Member State. It refers to the remaining estimated economic lifecycle of a building where energy performance requirements are set for the building as a whole, or to the estimated economic lifecycle of a building element where energy performance requirements are set for building elements." [19]

The Dir. 2010/31/EU gives the basis for each state about the energy performance certificate such as: the energy performance of a building and reference values and may include additional information such as the annual energy consumption for non-residential buildings and the percentage of energy from renewable sources in the total energy consumption. The certificate also have to include recommendations for the cost-optimal or cost-effective improvement of the energy performance of a building or building unit. The recommendation can be of two main type, those connected with major renovation of the building envelope or system and those not connected to the renovation. Those recommendations needs to be feasible for the specific case and may give the range of payback period or the cost- benefits over the lifecycle.

Art. 11.8 give the time frame of validity of the certification in 10 years.

[19] Art. 2 Dir 2010/31/EU

EU commission should by 2011 develop a common scheme of certification scheme for non-residential buildings, that member state are encouraged to adopt, also not totally, by adapting it to national circumstances.[20]

Art. 12.1 defines the cases when the certification have to be provided:

- buildings or building units which are constructed, sold or rented out to a new tenant;
- buildings where a total useful floor area over 500 m 2 is occupied by a public authority and frequently visited by the public. On 9 July 2015, this threshold of 500 $m^2$ shall be lowered to 250 $m^2$.

The requirement is not applied for those buildings or buildings unit that already have a certificate in accordance with the directive 2002/91/EC.

A copy of the Energy performance certificate is provided to the buyer or rented, also in cases of sales in advance of construction an assessment of the energy performance must be provided. The energy performance certificate should also be published together with the advertisements in commercial media of the buildings or buildings unit. [21]

According to Art. 17 the energy performance "certification of buildings is carried out in an independent manner by qualified and/or accredited experts, whether operating in a self-employed capacity or employed by public bodies or private enterprises. Experts shall be accredited taking into account their competence.

Member States shall make available to the public information on training and accreditations. Member States shall ensure that either regularly updated lists of qualified and/or accredited experts or regularly updated lists of accredited companies which offer the services of such experts are made available to the public."[22]

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[20] Art. 11 Dir 2010/31/EU
[21] Art. 12 Dir 2010/31/EU
[22] Art.17 Dir 2010/31/EU

ANNEX I

Common general framework for the calculation of energy performance of buildings

(referred to in Article 3)

1. The energy performance of a building shall be determined on the basis of the calculated or actual annual energy that is consumed in order to meet the different needs associated with its typical use and shall reflect the heating energy needs and cooling energy needs (energy needed to avoid overheating) to maintain the envisaged temperature conditions of the building, and domestic hot water needs.

2. The energy performance of a building shall be expressed in a transparent manner and shall include an energy performance indicator and a numeric indicator of primary energy use, based on primary energy factors per energy carrier, which may be based on national or regional annual weighted averages or a specific value for on- site production.

The methodology for calculating the energy performance of buildings should take into account European standards and shall be consistent with relevant Union legislation, including Directive 2009/28/EC.

3. The methodology shall be laid down taking into consideration at least the following aspects:

a. the following actual thermal characteristics of the building including its internal partitions:

i. thermal capacity;

ii. insulation;

iii. passive heating;

iv. cooling elements; and

v. thermal bridges;

b. heating installation and hot water supply, including their insulation characteristics;

c. air-conditioning installations;

d. natural and mechanical ventilation which may include air-tightness;

e. built-in lighting installation (mainly in the non-residential sector);

f. the design, positioning and orientation of the building, including outdoor climate;

g. passive solar systems and solar protection;

h. indoor climatic conditions, including the designed indoor climate;

i. internal loads.

4. The positive influence of the following aspects shall, where relevant in the calculation, be taken into account:

a. local solar exposure conditions, active solar systems and other heating and electricity systems based on energy from renewable sources;

b. electricity produced by cogeneration;

c. district or block heating and cooling systems;

d. natural lighting.EN 18.6.2010 Official Journal of the European Union L 153/29

5. For the purpose of the calculation buildings should be adequately classified into the following categories:

a. single-family houses of different types;

b. apartment blocks;

c. offices;

d. educational buildings;

e. hospitals;

f. hotels and restaurants;

g. sports facilities;

h. wholesale and retail trade services buildings;

i. other types of energy-consuming buildings.

ANNEX II

Independent control systems for energy performance certificates and inspection reports

1. The competent authorities or bodies to which the competent authorities have delegated the responsibility for implementing the independent control system shall make a random selection of at least a statistically significant percentage of all the energy performance certificates issued annually and subject those certificates to verification.

The verification shall be based on the options indicated below or on equivalent measures:

a. validity check of the input data of the building used to issue the energy performance certificate and the results stated in the certificate;

b. check of the input data and verification of the results of the energy performance certificate, including the recommendations made;

c. full check of the input data of the building used to issue the energy performance certificate, full verification of the results stated in the certificate, including the recommendations made, and on-site visit of the building, if possible, to check correspondence between specifications given in the energy performance certificate and the building certified.

2. The competent authorities or bodies to which the competent authorities have delegated the responsibility for implementing the independent control system shall make a random selection of at least a statistically significant percentage of all the inspection reports issued annually and subject those reports to verification.

Reference

*-Art. 2 Dir 2010/31/EU*

*-Art. 11 Dir 2010/31/EU*

*-Art. 12 Dir 2010/31/EU*

*-Art. 17 Dir 2010/31/EU*

*-Annex I Dir 2010/31/EU*

*-Annex II Dir 2010/31/EU*

### 2.1.3 Innovative elements in Directive 2010/31/EU

As previously analysed, the directive 2010/31/EU, has added some new elements, one of them already mentioned is the concept of 'cost-optimal level', that is one of the key features of the directive which focus its attention on the energy performance level which leads to the lowest cost during the estimated economic lifecycle.

Some other elements have been added ex novo in the new directive, the target set by the EU to reduce by 20% the energy consumption by 2020, led to a new definition: 'nearly zero-energy building'. A nearly zero-energy building is a building that has a very high energy performance. The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources. EU indicates that by 2020 all private new construction should be nearly zero-energy building and after 31 December 2018, new buildings occupied and owned by public authorities are nearly zero-energy buildings. Looking at data provided by Cened, is possible to see that Italy has still a lot of work to do, in fact, by 31/10/2017 almost half of the certification provided for building are in G class, and more than 75% of Energy certificate are in a class lower than E.

A new definition added in the directive is the one about the major renovation, an element which in the 2002 Directive was deal with just in the initial consideration, but not later explained in detail. A major renovation is a renovation where the total cost of the renovation relating to the building envelope or the technical building systems is higher than 25 % of the value of the building, excluding the value of the land upon which the building is situated or more than 25 % of the surface of the building envelope undergoes renovation. Member State can decide to apply just one of the two definition of Major renovation. This definition is important because buildings or buildings unit, undergoing renovation shall meet minimum energy performances requirement. Is also very important the role member state can take on, to incentive reaching those requirements.

The 2010 Directive had also add some information about the recommendations for the cost-optimal and cost-effective improvements of energy performances of buildings. Those measure as already mentioned should cover both major renovation works or individual element works. Anyway the major point is that those works should be feasible for the specific case, providing a range of payback and also a cost-benefits over the economic lifecycle.

One of the most innovative elements is given by Art. 18 of the Directive. This article focus its attention on the necessity for the Member state to require an independent control over the expert providing the energy certification for buildings. According to Annex II the independent control should verify randomly a significative number of certificate to verify its compliance with the directive request. The independent control must verify the input data and the final results and also check the recommendations made, if possible the controller should also visit on-site the building to check correspondence between specifications given in the energy performance certificate and the building certified.

Reference:

*-Art. 2 Dir 2010/31/EU*

*-Art. 7 Dir 2010/31/EU*

*-Art. 9 Dir 2010/31/EU*

*-Art. 10 Dir 2010/31/EU*

*-Art. 11 Dir 2010/31/EU*

*-Art. 18 Dir 2010/31/EU*

*-Annex Dir 2010/31/EU*

## 2.2 ITALIAN LEGISLATION

In 2005 Italy, developed its own legislation about the Certification of buildings with the Legislative Decree 192/2005 this decree was developed to adopt the Directive 2002/91/EC and set the general rule about the energy certification of buildings and develop a methodology for calculating the integrated energy performance of buildings. After the Directive 2010/31/EU and after the Procedure for failure to fulfil obligations (RICORSO PER INADEMPIMENTO) under EU law started on July 19$^{th}$ 2012 Italy developed a new Law Decree 63/2013, converted into law and modified with the Law 90/2013.

### 2.2.1 Legislative Decree 192/2005

Italy adopted the European Community directive 2002/91 with the legislative decree 192/2005 on August 19th 2005. This Leg. Decree has a main objective the criteria and modalities to improve the energy performance of building as established by Kyoto Protocol. As wanted in the 2002 Directive the Italian Law gave regulation about the energy certification of buildings and develop a calculation methodology of energy certification of buildings.[23]

The energy performance is defined as the quantity of energy annually consumed or supposed to be consumed by a building in standard conditions. This quantity of energy should be expressed by one or more indicator, based on the building

[23] Art. 1 Legislative Decree 192/2005

characteristic. This definition follow precisely the definition given by the EC directive. [24]

The energy performance certificate is defined as the certificate providing the energy performance of the buildings. The Energy performance certificate is required in case of new construction of building, sales or rent, has a maximum validity of 10 years. As required by the EC directive the certificate should give information to improve performances of the building.[25] A point of lack of Italian legislation are the missing information about the independent expert that should make the certification as required in Art. 10 of the 2002/91 Directive. Art. 4 of 192/2005 Legislative decree defined that in 120 days Italian Republic through one or more Presidential Decree (DPR), more information about the independent expert should be give.[26]

*Reference:*

*-Art. 1 Legislative Decree 192/2005*

*-Art. 2 Legislative Decree 192/2005*

*-Art. 4 Legislative Decree 192/2005*

*-Art. 6 Legislative Decree 192/2005*

### 2.2.2 Court Decision June 13TH 2013

On June 13th, 2013 the European Court judges ruled Italian failure to adopt EC Directive 2002/91. In particular, what was challenged by the European Commission was the bad adoption of the article 7 Paragraph 1 and 2 (Energy performance certificate) and article 10 (Independent experts).

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[24] Art. 2 Legislative Decree 192/2005
[25] Art. 2 Legislative Decree 192/2005 - Art. 6 Legislative Decree 192/2005
[26] Art. 4 Legislative Decree 192/2005

In the Italian norm those two article has been adopted through: Legislative Decree 192/2005 Article 6 Paragraph 2 and Ministerial Decree of June 26$^{th}$, 2009 (Linee guida nazionali per la certificazione energetica degli edifici) Annex I, Paragraph 9. [Paragraph 1 Court Decision 13 giugno 2013]

According to the European Commission Art. 6 allow to rent buildings or building units, without an Energy performance certificate, this represent an incorrect adoption of Art. 7 of EC Directive. [Paragraph 11-19-20-26 Court Decision 13 giugno 2013]What is more, Art. 9 in specific case of Building of surface lower than 1000 m$^2$ , in case of building of poor quality, should provide a self-certification that the building is in G class and the operating cost are very high. According to the Commission this represent an incorrect adoption of the EC, in fact, the Directive required the Certificate to be provided together with information to improve the energy performances and to be provided by a qualified and independent expert. [Paragraph 12-21-22-23-27 Court Decision 13 giugno 2013]

The court decision was to condemn Italy due to an incorrect adoption of Art. 7 and 10 of 2002 Directive. [Paragraph 30 Court Decision 13 giugno 2013]

*Reference:*

*-Paragraph 1 Court decision June 13th, 2013*

*-Paragraph 11-19-20-26 Court Decision 13 giugno 2013*

*-Paragraph 12-21-22-23-27 Court Decision 13 giugno 2013*

*-Paragraph 30 Court Decision 13 giugno 2013*

### 2.2.3 Law Decree 63/2013, LAW 90/2013

Law Decree 63/2013 was introduced in Italian legislation to adopt EU Directive 2010/31, as required by Italian legislation the Law Decree was converted into law through Law 90/2013. This law was also developed also due to the court decision of

June 13th, 2013 that condemned Italy to have incorrectly adopted the 2002/91 Directive, in fact, this law is defined as an Urgent provision to adopt 2010/31 Directive.

The act defined as principal objective to determine the general criteria of the energy performance certification of buildings and the transfer of those information in rent and selling phase. As required by the EU 2010 Directive, Italy focus his attention on new elements that were not present in the 2002 Directive. In the 2013 Act has been introduced the necessity for Italy to monitor the adoption of the norm, through the gathering of data through an independent control, the cost-optimal level, nearly zero-energy building and major renovation that Italy decided to adopt as more than 25 % of the surface of the building envelope undergoes renovation.

As required by Court decision of the June 13th, 2013 Italy modified Article 6.2 of Legislative Decree 192/2005 that required the certification of building or building units in case of rent or sales.

## 2.3 LEGISLATION FROM DENMARK AND NETHERLANDS

Denmark and Netherlands, as member state of the EU had to adopt the EU legislation about the Energy performance of Building, wanted by the TFEU. Anyway, both countries had already developed Energy performance certificate system, in Denmark it existed since the 1997, while in the Dutch system it was a voluntary system to assign labels to existing buildings.

The Danish regulation follow the EU directive, in fact, it has to provide a list of cost-effective measure to improve the energy performances, those measure should also includes a short description, estimates costs, savings and payback, what is more they can also present the impact on energy rating if all measure were implemented, as required by the EU directive those measure should be specifically made for the building. All the new building or buildings that change type of usage should have a EPC, rated at least B to be granted a permit for use. All existing building both residential or non-residential, need to be certified when they are sold or rented when the contract is established.

Denmark, differently from what was required by EU legislation, adopted in 2011 a legislation in which only certified company can issue an EPC. A company to be certified must implement an ISO 9001 QA scheme for its building energy certification system. This mean that in Denmark only 40 company, hiring 800 expert/adviser can provide EPC. [SITUATION AT END 2012] [Paragraph 3 Implementation of the EPBD in Denmark status at end 2012 Report] What is more there are two kinds of energy advisers/ experts available for the market:

- Energy experts covering single and two-family houses of less than 500 $m^2$ , those kind of expert should be architect, engineer, construction designer or pass a special test developed by DEA. Those experts should also have a minimum of 2 yrs experience in the field during the last 6 years.

- Energy experts covering multifamily houses, public buildings, trade and service sectors. Those experts should be qualified engineers or have a similar profession, or pass a special test approved by the DEA. The advisers shall participate to courses or seminar on a regular basis.

In accordance to what required by the EU directive, to verify the quality of the EPC in an independent manner, DEA carries out market surveillance of the companies. EPCs are registered on a central database and randomly selected for check, the DEA verify the 0.25% of all EPC, that are re-issued by another, specially appointed expert to verify results. In case errors are detected, company have to modify the EPC, in the worst case, the certified company can be suspended from the EPC market.

In the Dutch market, the energy performance certificate should be issued, as required by the European regulation in case of selling or leasing. The improvement measures, could be contained in the EPC twice, the first are basically improvements, as required by the EU directive, but more precise "tailor made" improvements advices could be issued with the energy performance certificate. The EPC are collected in an information system, which has also been developed to monitor and make quality controls. In case of sales, the enforcement of compliance is possible only when a request for EPC had been issued.

As for the case of the Danish legislation the EPC are issued by specific companies. The independent expert in the Netherlands is required to have higher-building education, what is more, they have to pass an additional exams to became accredited experts. Those advisors are anyway checked by other bodies that should verify randomly the EPC through the use of the Information system and by checking if it is in compliance after a visit on site.

The Dutch government, tried to keep prices as low as possible for issuing an Energy Performance Certificate in the country. To keep prices low, as already mentioned the energy savings tailor-made advices, could be issued in a separate moment from the issuing of the EPC and so make it more cost-effective to the end-users.

*References:*

*-Energy Performance Certificates across Europe The Buildings Performance Institute Europe (BPIE) 2010*

*-Implementation of the EPBD in Denmark Report 2010*

*-Implementation of the EPBD in Denmark Report 2012*

*-Implementation of the EPBD in Denmark Report 2014*

# Chapter 3

# HOW THE MARKET VALUE, CAN BE INFLUENCED BY THE ENERGY PERFORMANCES

The aim of this chapter is to analyse from the literature, example of the correlation between the EPC and Value of the Buildings. The paper analysed gave clear evidence that the EPC represents a plus for the investors and for the final users. The analysis takes into account studies from Europe, written in states that are member of the European Union and have been wrote after the European Union directives 2002/91 and 2010/31, so under a legislation very similar to the Italian one, analysed in *Chapter 2*. Others article has been taken from the US where do not exist an Energy Performance Certificate but the "green" building are certificated through LEED classification. Moreover, the analysis considers which are the general benefits for the renter and for the owner, trying to define some major key points that will be the basis for the further analysis of *Chapter 4* and *Chapter 5*. The analysis will starts from the crystal clear concept that the energy efficiency in building, represents an energy savings and so a reduction of housing costs. The topic of the papers are mainly office buildings and residential buildings.

## 3.1 Literature review for Office Buildings

According to some specific studies developed by the Italian periodical "Casa&Clima", is very important to focus the attention of the Energy Performance of buildings for investment real estate. The Italian "Istituto per la Competitività (I-Com)" developed through a research an analysis of the differences of the energy cost for a period of 20 years among each energy labels. The results are shown in *Figure 3.1.1*:

| | Matrice delle differenze di costi energetici su 20 anni tra le varie classi di consumo di un edificio (X-Y) [€/m$^2$] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Y | | | | | | | |
| | | A+ | A | B | C | D | E | F | G |
| X | A+ | 0 | -20 | -46 | -77 | -108 | -146 | -200 | -292 |
| | A | 20 | 0 | -26 | -57 | -88 | -126 | -180 | -272 |
| | B | 46 | 26 | 0 | -31 | -62 | -100 | -154 | -246 |
| | C | 77 | 57 | 31 | 0 | -31 | -69 | -123 | -215 |
| | D | 108 | 88 | 62 | 31 | 0 | -38 | -92 | -185 |
| | E | 146 | 126 | 100 | 69 | 38 | 0 | -54 | -146 |
| | F | 200 | 180 | 154 | 123 | 92 | 54 | 0 | -92 |
| | G | 292 | 272 | 246 | 215 | 185 | 146 | 92 | 0 |

*Figure 3.1.1 Energy cost matrix developed for 20 years analysis, among each energy label*

As we can see, according to *Figure 3.1.1* the difference in cost between a building labelled as A+ and one labelled G is 292€/sqm. This analysis has been developed before the 2015, so the energy label refers to previous legislation and the time of the analysis of 20 years. A timeframe equal to 20 years represents a correct observation by the viewpoint of the owner of the building, but do not reflect the benefits for tenants. In fact, according to the Italian Law 392/78 the standard duration of lease contract, is 6 years plus a tacit renewal, at the same condition for 6 more years. So the analysis represented in *Figure 3.1.1* can give an important initial point for investors, where they can understand the increase in appeal their building can represent for tenants. In fact, for buildings bought as investment the reduction of costs, is not a benefit of the owner but for the tenants, which are those that are going to pay for the energy expenses.

As just mentioned, buildings with high energy efficiency represent a plus both for the owner and for the renter. In case the owner of the building is not the end-users, these benefits do not reflect on him, but on the tenant or on the tenants in case there are more than one, this cost saving flows directly to the end users. The return for the investors or owner of the building is so more uncertain as described in paper "The impact of energy labels and accessibility on office rents"[27] - Nils Kok[28], Maarten Jennen[29]: "For investors, the return is thus uncertain, consisting of better marketability of properties (e.g. lower vacancy risks, higher rents while keeping total housing costs fixed, shorter rent-free periods) and higher valuations (following lower cap rates and reduced depreciation)." The study from Nils Kok and Maarten Jennen, has been conducted in the Netherlands, which as part of EU adopted the same legislation about the Energy Performance Certificate, which according to their opinion has been a benefits in the market: "The implementation of energy performance certificates can be regarded as an additional step towards transparency of energy consumption in buildings, enabling private and corporate occupiers to take energy efficiency into account when making housing decisions."

Similar concepts have been described by Fuerst F[30]., McAllister P.[31] and Ekeowa B. author of the paper: "The Impact of Energy Performance Certificates on the Rental and Capital Values of Commercial Property Assets: Some Preliminary Evidence from

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27 23May2011
28 Maastricht University, The Netherlands
29 Rotterdam School of Management, CBRE Global Investors, The Netherlands
30 University of Cambridge, United Kingdom
31 Henley Business School, United Kingdom

the UK"[32]. They underlined that from the occupiers "perspective", "operating from a more energy efficient building may increase productivity, reduce running costs, meet corporate social responsibility objectives and attract financial incentives (or help avoid environmental taxes)". From the owner perspective, they stated that: "investors may also benefit from reduced holding costs (due to lower vacancy rates and higher tenant retention), reduced operational costs (due to energy and other utility savings), reduced depreciation (linked to the use of latest technologies) and reduced regulatory risks."

Under the viewpoint of an investors is important to determine if companies are willing to pay more, a premium in the rent, for "green" buildings. According to the two authors, Nils Kok and Maarten Jennen, the "willingness to pay for green Real Estate in the European commercial property market is mostly anecdotal". To investigate this matter, a Corporate survey has been conducted by Jones Lang LaSalle and Core Net Global in 2011, the outcome gave some very important results: 83% of the companies interviewed stated that they are willing to pay a rental premium, if it reflects tangible benefits, according to the two authors this benefits shall reflects social factors but of course also a potential reduction in the operating costs, that in the case under analysis are represented by energetic costs.

The outcome of the paper "The impact of energy labels and accessibility on office rents" can be summarized in:

- Energy efficiency affects rental level and rental growth;
- In order to reduce total housing costs, i.e., the combined cost of rent and service and energy charges, the tenant will, ceteris paribus, prefer energy efficient buildings over non-efficient alternatives;
- Other variables have been taken into account in the paper, like the accessibility and the age of buildings;

32 February 2011

- The rental difference between the most efficient building and the least efficient building in the sample is more than 12%;
- There is not a significant evidence that a ''green" energy label has a different value in Amsterdam as compared to the remainder of the country;
- The lack of investments in energy efficiency in 2011 was partially due to high cost of retrofits and due to a credit constraints among investors and due to a lack of systematic evidence on the returns to ''greening'' existing properties;
- Sustainability matters for real estate users;
- Rental growth in efficient and less efficient buildings differs markedly.

In the US an analysis similar to the one conducted in Europe has been developed by Jonathan A. Wiley[33], Justin D. Benefield[34] and Ken H. Johnson[35], in the paper: "Green Design and the Market for Commercial Office Space"[36]. As mentioned before the US, labels green building through the "Green Building Certification Institute" that provide LEED certifications. The authors, searched for a correlation and some evidence that indicates that "green" buildings achieve superior rents and sustain significantly higher occupancy. The improved performance in the rental market is reflected in a significant premium for the selling price of Energy Star-labelled and LEED-certified properties. In the conclusions the three authors highlighted that: "Energy Star-labelled and LEED-certified properties maintain superior performance in the leasing markets, which is reflected in a significant sales premium for green-labelled class A office buildings." They searched for the difference in rent between "green-labelled" buildings and "non-green-labelled" the results they obtained have

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33 Georgia State University, United States
34 Auburn University, United States
35 Florida Atlantic University, United States
36 June 2008

been defined by the three authors as dramatic: "The premiums for green design are dramatic. Rents are higher by roughly 7 to 17%; occupancies improve by roughly 10 to 18%. The selling premium is estimated at $30 and $130/ft2 for Energy Star-labelled and LEED-certified properties, respectively."

They tried to give an explanation to this phenomenon, according to them green-labelled properties are relatively new in the market and benefit from an improved marketability. Moreover, the real estate market is well known to be an inelastic market, and due to this inelasticity, unbalance in supply and demand is exploited. Anyway they continue by saying that: "As new products are increasingly energy-efficient, the premiums for future deliveries should adjust proportionately. Nonetheless, given the magnitude and significance of these premiums, it seems plausible that additional factors are adding value to green buildings beyond the simple savings in operating expenses."

A report has been also developed by U.S. Green Building Council through the LEED system, acronym for Leadership in Energy and Environmental Design and the most widely used green building rating system in the world. The Council reported the market performances of the building owning a LEED certificate. As they stated: "The findings [about market performances for building with a LEED certificate] from direct currents 2012 Private Building Benchmarking Disclosure data are encouraging and reinforce the market value of LEED certification." According to their research they estimated that LEED office buildings had in 2012:

- a 13% lower average site energy use intensity (64.0 kBtu [kilo British termal unit]/SF [square foot] vs. 73.3 kBtu/SF), (193.75 kWh/sqm vs 230,24 kWh/sqm);
- a 11% lower average electricity usage (18.0 kWh/SF vs. 20.2 kWh/SF), (193.75 kWh/sqm vs 217,43 kWh/sqm)
- a 16% lower average water usage (17.9 Gal/SF vs. 21.4 Gal/SF) when compared to non-LEED certified office buildings.

As is possible to see the parameters take into account in the analysis, are the same analysed in the EPC, drafted in the EU mentioned in *Chapter 1.2*.

The evaluation conducted by the U.S. Green Building Council continued with the difference between the average difference between the energy expenses in LEED certified office building is esteemed in:

- $0.22/SF ($ 2,37 /sqm);
- The average size of LEED Building is 359.000 SF (33.352 sqm);
- The financial advantage is evaluated in $ 80.000 given by a reduction in operating costs;
- Assuming a 5.5% cap rate, this $80,000+ annual financial advantage equates to $1.5 million in increased asset value.

After the analysis of the literature we can highlights some major elements. First of all, energy efficiency in office buildings, represents an energy savings and so an operating cost reduction for tenants. This operating cost reduction reflects mainly in


*Figure 3.1.2 Scheme of the total housing cost calculated as sum of Base rent, energy expenses and premium rent.*

a willingness by tenants to pay a premium rent for more efficient building, if the total housing cost is kept stable. Several studies had underlined the correlation between the energy efficiency and the values of buildings, this value is mainly represented by a premium coming from the present value of future energy savings.

## 3.2 Literature review for Residential Buildings

In the residential sector some preliminary analysis has been conducted in the Italian market by Casa24Plus[37]. The analysis has been conducted in 2012 just after the came into force of the regulation that oblige sellers to provide an Energy Performance Certificate during the marketing phase, so all the advertisement of residential has to be provided with an effective EPC. As the biggest online source of real estate advertisement the main source of the information, was the online website Immobiliare.it. According to this preliminary analysis, the outcomes showed that on average a building unit composed by 2 rooms, labelled as A had a price premium that is almost the 21% higher if compered to one labelled C, and C labelled building units had prices almost 10% higher than those in G label. This analysis, anyway do not reflect real values of buildings but the listing prices.

Another analysis in the Italian listing prices has been conducted in the late 2014 by Elena Fregonara[38], Diana Rolando[39], Patrizia Semeraro[40] and Marta Vella, in the paper: "The impact of energy performance certificate level on house listing prices[41]". The aim of the analysis was to find evidences if there is a correlation between the energy labels and listing prices of houses in the city of Turin, the analysis has been performed through a hedonic price model on a sample of more than 500 listing prices. Through a preliminary analysis the authors found out that the average price of building units with an EPC in label B or C is on average higher than the EPC rated lower than C.

37 http://www.casaeclima.com/ar_8907__ITALIA-Ultime-notizie-classe-energetica--annunci-immobiliari-Immobili-quanto-incide-la-classe-energetica-sui-prezzi.html
38 Politecnico di Torino
39 Politecnico di Torino
40 Politecnico di Torino
41 December 2014

Anyway, after an analysis conducted through the hedonic price method of the listing prices, the study did not found evidence of a relationship between EPC and listing price, the only acceptable level of correlation was found for "F" energy label, that was the only one with the necessary significance value. They explained the low correlation through a weak interest by the apartments potential buyers, which seems not yet aware that to make a higher initial investment in a property characterized by a high energy level means future lower maintenance costs, due to this reason the owners wouldn't make investment in refurbishment actions to improve the sales of their properties.

After the Italian market, the analysis of the literature moved forward to a foreign investigation that has been conducted on the residential sector by Dirk Brounen[42] and Nils Kok [43] in their paper "On the economics of energy labels in the housing market"[44]. The analysis has been conducted in the Dutch market, where thanks to the big amount of data collected by the Dutch information system, which in the 2009 had already collected more than 100.000 EPC that had been used in the analysis. The paper reports the analysis of the two authors, analysing the evidences on the market adoption of the energy performance certificate and their economic implications after the implementation of the European Union directives. According to the European Union directives the Energy Performance Certificate should increase the transparency of the market, providing to buyers or tenants reliable information on energy efficiency. Those evidences certificated with a rating in an EPC, according to the two authors can be capitalized by in higher transaction values. In fact, this capitalization should translate into a price discount for less energy efficient homes or a premium for more energy efficient ones.

42 Rotterdam School of Management, The Netherlands
43 School of Business and Economics, Maastricht University, The Netherlands
44 May 2010

The results of the paper are very important because differently from the Italian, the Dutch market shows important results: "Homes with a label A, B, or C, which are generally referred to as ''green'' labels, transact at an average price premium of 3.7 %, ceteris paribus. Considering that the average transaction price of a dwelling in the certified sample equals €231,000, the euro value of the ''green'' price premium amounts to €8449, at the point of means" This type of analysis gave a similar outcome to the preliminary analysis conducted in the Turin Case, but the outcome of the regression model is totally different in fact: "We document that the premium for energy efficiency constitutes a series of positive price effects that correspond to the outcomes of the different label categories. We find that A labelled homes transact at a price premium of 10.2percent as compared to similar homes with the intermediate D label , and dwellings with a G label transact at a discount of some 5 percent."

Moreover, the two authors discuss how the energy efficiency can reflect into a premium, according to their results it seems to be related to the present value of future energy savings resulting from higher energy efficiency. To support their idea they showed real data: "In 2009, a standardized Dutch dwelling had an average monthly energy bill of €152, ranging between €105 for energy label A, to €231 for energy label G. Capitalizing the difference in the energy bill of an F labelled dwelling, compared to a G labelled dwelling, results in a present value of €4000. This is about 1.8% of the average transaction price and slightly lower as compared to the average price difference between F- and G labelled dwellings [..]. Comparing the capitalized energy savings of A labelled dwellings with G labelled dwellings yields a present value of about €16,000, or 7.2 percent of the average transaction price."

In the United Kingdom a similar research has been made by the National Government. A research developed by the DECC, Department of Energy and Climate Change, had analysed more than 300.000 sales properties in the UK, from 1995 to 2011, as was said by former Minister of Energy and Climate Change, Greg Barker: "We have long known the benefits of making energy saving improvements to the home, but this study is real evidence of the huge potential rewards. Not only can energy efficient improvements help protect you against rising energy prices, but they can also add real value to your property". The study identified which can be the increase in value in monetary terms, from moving a property in different labels, analysing also the change in prices at the regional level.

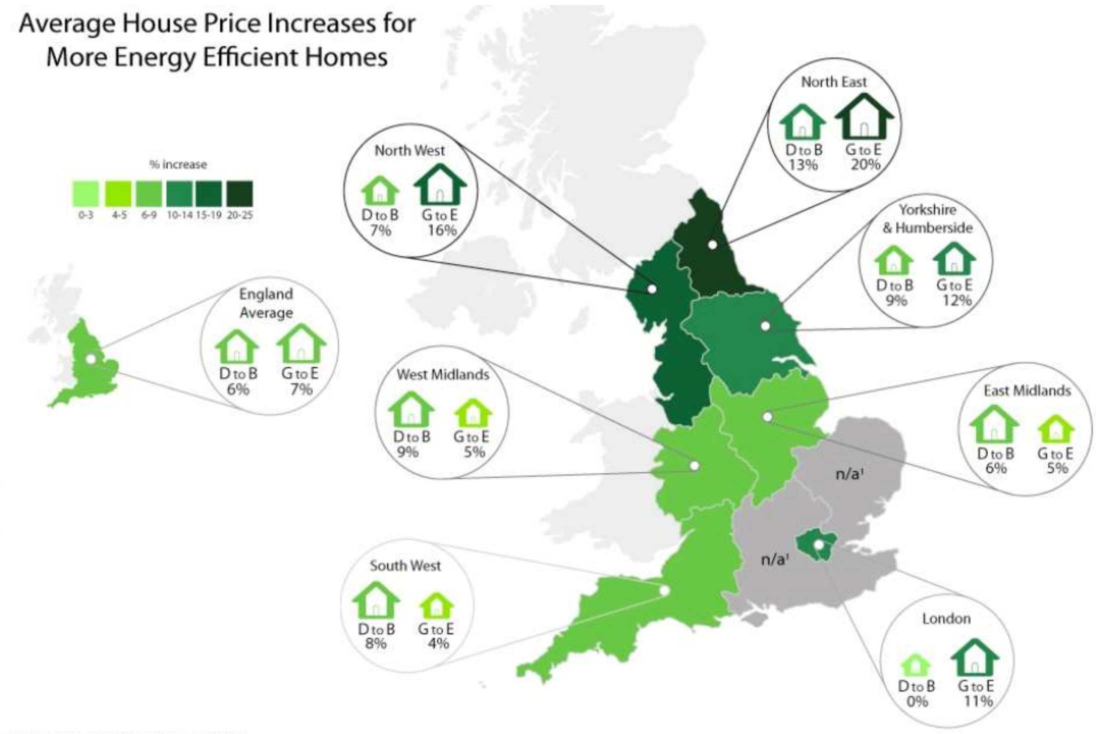



*Figure 3.2.1 The average house price increase (%), for more energy efficient homes*

| | EPC D to B | EPC G to E |
|---|---|---|
| England average | £16,009 | £16,701 |
| North East | £19,265 | £25,355 |
| North West | £12,979 | £23,155 |
| Yorkshire & Humberside | £15,945 | £17,298 |
| East Midlands | £10,936 | £10,177 |
| West Midlands | £16,882 | £9,282 |
| East of England | n/a[1] | n/a[1] |
| South East | n/a[1] | n/a[1] |
| South West | £16,342 | £8,026 |
| London | £1,100 | £41,808 |

*Figure 3.2.2 value increase (£) from propertiers moving from EPC D to B & EPC G to E*

| | EPC A/B | **EPC C** | **EPC D** | **EPC E** | **EPC F** |
|---|---|---|---|---|---|
| England average | 14% | 10% | 8% | 7% | 6% |
| North East | 38% | 26% | 23% | 20% | 15% |
| North West | 27% | 21% | 18% | 16% | 12% |
| Yorkshire & Humberside | 24% | 16% | 14% | 12% | 9% |
| East Midlands | 16% | 11% | 7% | 5% | 3% |
| West Midlands | 17% | 10% | 7% | 5% | 5% |
| East of England | 7% | 5% | n/a[2] | n/a[2] | 4% |
| London | 12% | 12% | 12% | 11% | 10% |
| South East | n/a2 | n/a[2] | n/a[2] | n/a[2] | n/a[2] |
| South West | 12% | 7% | 4% | 4% | 3% |

*Figure 3.2.3 Value increase (%) based on properties moving from EPC G*

According to those major key point, the analysis of the market value will be investigated in the next chapters.

# Chapter 4

# DEFINITION OF AN EVALUATION MODEL FOR THE PREMIUM VALUE

The evaluation of the energy performance label has been developed for 3 specific cases: Offices buildings, Retail buildings and Residential buildings. The idea beyond this evaluation starts from the crystal-clear concept that a green labelled building will generate less expenses for the tenants of the building. In fact, in every rental contract, energy expenses are not paid by the owner of the building but are paid by the tenant or split by more tenants if there are more than one.

According to law 392/78[45], the Italian law that discipline lease contract in Italy the standard duration is 6 years for commercial, industrial and office spaces, while the duration for lease contracts for residential buildings is 4 years. Both contracts are under the discipline of the tacit renewal, so in Italy usually the commercial lease contracts are defined as 6+6 years contracts while the residential 4+4 years. For this

[45] Gazzetta Ufficiale n. 211 del 29/07/1978 “Disciplina delle locazioni di Immobili Urbani”

reason, for commercial Building the period of analysis that will later be discussed will be 12 years while for residential buildings 8 years.

The aim of this chapter is to define the value in €/sqm starting from the energy expenses for each energy performance rating of buildings as defined in the EPC. The analysis will start from the concept that a tenant has the willingness to pay a higher rent if he is going to pay a lower amount in energy expenses. And for the same reason a Buyer is willing to pay more for a Building if he can receive a higher rent during the economic life-cycle of the building.

The structure of the analysis will be based according to these premises: Rent Value is given by the premium rent (related to the energy performance) plus the average market rent of the building.

$$RV = PR_{Value} + MV_{avg}$$

*Where:*

*RV: rent value*

*PR value: premium rent given by the energy performances*

*MR: average market rent*

The Value of the premium related to the energy performance can be defined through the net present Value of the difference between the energy cost of a building in G class and the cost of energy of Reference Building.

$$PR_{value} = NPV(CE_{Class\ G}) - NPV(CE_{Reference\ Building})$$

*Where:*

*PR value: Premium rent calculated as future energy savings*

*$CE_{classG}$ : Cost of energy specific for the class G buildings*

*$CE_{reference\ Building}$ : Cost of energy specific for the building that is took as reference*

*NPV: formula of the net present value: $NPV= CF/(1+i)^t$*

*Where:*

*CF: cash Flow*

*i: interest rate*

*t: time*

The cost of Energy for both case are defined through the same formula:

$$CEtot = \Sigma \ CE_{tn} \times (1 + Istat\ Update)^{t}$$

*Where:*

*CEtot: Cost of energy*

*CEtn: Cost of energy at time n*

*Istat indes: increase of prices according to istat*

*t: reference time*

# 4.1 PREMIUM VALUE MODEL DEFINITION, ASSET CLASS OFFICE

In this first section, will be investigated the premium value that reflects the present value of future energy savings for office buildings. The classification for the office building started from an EPC drafted for the Italian classification "E2" defined in the DPR 412/93 [46] as Buildings used as offices and similar: public or private. The EPC has been drafted in the 2015, for commercial spaces in the climate area defined as E[47].

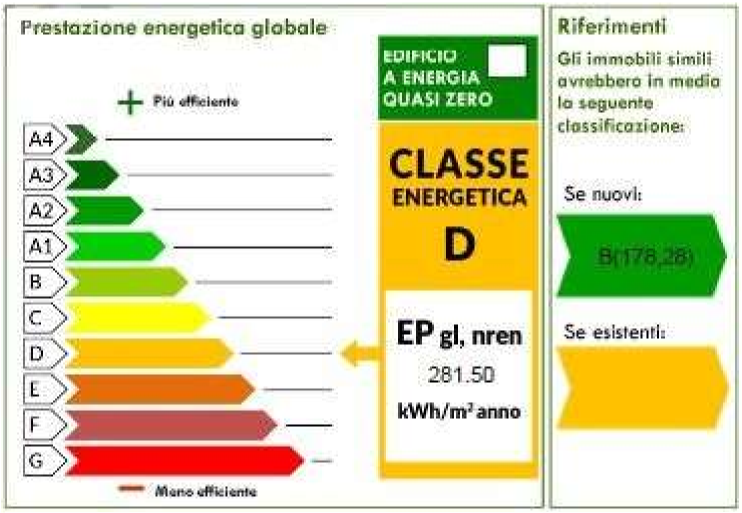



*Figure 4.1.1 Energy Performance Certificate for office Building, took as reference for the analysis*

The energy consumptions are expressed in kWh/sqm per year and are different for each energy label. Those amount shows, an average of the energy consumed annually in each energy label, and have been calculated according to the parameters given by the regulation.

- A4 71,31 kWh/sqm per year
- A3 89,14 kWh/sqm per year
- A2 124,80 kWh/sqm per year
- A1 160,45 kWh/sqm per year

[46] DPR 412/93 Art. 3 General definition of building by typology
[47] DPR 412/93 Art. 2. Definition of the climate area

- B 178,28 kWh/sqm per year
- C 240,68 kWh/sqm per year
- D 281,50 kWh/sqm per year
- E 410,04 kWh/sqm per year
- F 543,75 kWh/sqm per year
- G 623,98 kWh/sqm per year

The amount of energy annually consumed for each square meter of space can be then used to define the average price for each square meter in each energy label, by multiplying the amount of energy by an average cost of energy that is assumed in 0,09 €/kWh.

In *Table 4.1.2* are shown the results of the energy cost per year (€/sqm) according to the different energy performance rating. Starting from the more performing energy label A4 we have an expense of € 6,42 per square meter of space, while the less performing energy label is G with an annual expense of € 56,16 per sqm.

| *A4* | *A3* | *A2* | *A1* | *B* |
|---|---|---|---|---|
| €/sqm<br>6,42 | €/sqm<br>8,02 | €/sqm<br>11,23 | €/sqm<br>14,44 | €/sqm<br>16,05 |
| *C* | *D* | *E* | *F* | *G* |
| €/sqm<br>21,66 | €/sqm<br>25,34 | €/sqm<br>36,90 | €/sqm<br>48,94 | €/sqm<br>56,16 |

*Figure 4.1.2 Annual expenses deriving from energy cost for each energy labels*

To define a premium rent a tenant could accept to pay we can multiply the annual expenses for a period of 12 years. We have to consider that each year the annual expenses, should be updated according to the Istat increase in prices, that we will assume as 1,8%. Analysing office buildings, we can assume a period of analysis of 12 years, that is the typical duration of a lease contract in the Italian legislation, according to Art. 27 Law 392/78, which provides a standard duration for contract of 6 years plus a tacit renewal of 6 more years. Other contract like the 9+9 or the 4+4 are regulated for the hotel sector (Art. 27 Law 392/78) and for the residential sector (Art. 1 Law 392/78).

| *Year* | *1* | *2* | *3* | *4* | *5* | *6* |
|---|---|---|---|---|---|---|
| ***Label*** | ***Expenses* (€/sqm)** | | | | | |
| **A4** | 6,53 | 6,65 | 6,77 | 6,89 | 7,02 | 7,14 |
| **A3** | 8,17 | 8,31 | 8,46 | 8,62 | 8,77 | 8,93 |
| **A2** | 11,43 | 11,64 | 11,85 | 12,06 | 12,28 | 12,50 |
| **A1** | 14,70 | 14,97 | 15,23 | 15,51 | 15,79 | 16,07 |
| **B** | 16,33 | 16,63 | 16,93 | 17,23 | 17,54 | 17,86 |
| **C** | 22,05 | 22,45 | 22,85 | 23,26 | 23,68 | 24,11 |
| **D** | 25,79 | 26,26 | 26,73 | 27,21 | 27,70 | 28,20 |
| **E** | 37,57 | 38,24 | 38,93 | 39,63 | 40,35 | 41,07 |
| **F** | 49,82 | 50,72 | 51,63 | 52,56 | 53,50 | 54,47 |
| **G** | 57,17 | 58,20 | 59,25 | 60,31 | 61,40 | 62,50 |
| ***Year*** | ***7*** | ***8*** | ***9*** | ***10*** | ***11*** | ***12*** |
| ***Label*** | ***Expenses* (€/sqm)** | | | | | |
| **A4** | 7,27 | 7,40 | 7,54 | 7,67 | 7,81 | 7,95 |
| **A3** | 9,09 | 9,25 | 9,42 | 9,59 | 9,76 | 9,94 |
| **A2** | 12,73 | 12,95 | 13,19 | 13,43 | 13,67 | 13,91 |
| **A1** | 16,36 | 16,66 | 16,96 | 17,26 | 17,57 | 17,89 |
| **B** | 18,18 | 18,51 | 18,84 | 19,18 | 19,52 | 19,88 |
| **C** | 24,54 | 24,98 | 25,43 | 25,89 | 26,36 | 26,83 |
| **D** | 28,70 | 29,22 | 29,75 | 30,28 | 30,83 | 31,38 |
| **E** | 41,81 | 42,57 | 43,33 | 44,11 | 44,91 | 45,71 |
| **F** | 55,45 | 56,45 | 57,46 | 58,50 | 59,55 | 60,62 |
| **G** | 63,63 | 64,77 | 65,94 | 67,13 | 68,33 | 69,56 |

*Figure 4.1.3 Energy expenses calculated over 12 years,*
*Energy cost are updated according to ISTAT index.*

In *Table 4.1.3* are shown for the period of 12 years the energy expenses, expressed in €/sqm for each energy label, updated by the Istat increase of prices assumed equal to 1,80%.

The sum of all those value, cannot be used as they are, in fact we have to consider the Time value of money in a period of 12 years.

To define the time Value of Money we have to apply the Net Present Value (NPV) formula, the NPV is calculated as the sum of future cash flows, divided by the cost of capital, that in our case is calculated as 7,11%, where the risk free is assumed as 1,61% (the yield for EURIBOR IRS 30 years) plus a risk premium equal to 5,50%. The results obtained are shown in *Figure 4.1.4*. The results show that the today value of future expenses for A4 class are € 56,20 per sqm, while for G class are € 491,73 per sqm. This is not the premium value of the building, in fact the premium value as defined also in *Chapter 3* by Kok and Brounen is the value coming from the energy savings.

| **Energy performance rating** | **Expenses** | |
|---|---|---|
| NPV A4 Class | 56,20 | €/sqm |
| NPV A3 Class | 70,25 | €/sqm |
| NPV A2 Class | 98,35 | €/sqm |
| NPV A1 Class | 126,45 | €/sqm |
| NPV B Class | 140,50 | €/sqm |
| NPV C Class | 189,67 | €/sqm |
| NPV D Class | 221,84 | €/sqm |
| NPV E Class | 323,14 | €/sqm |
| NPV F Class | 428,51 | €/sqm |
| NPV G Class | 491,73 | €/sqm |

*Figure 4.1.4 Net Present Value (NPV) of the energy expenses, for each energy labels*

The energy savings are calculated by setting as reference the G Energy performance rating expenses and subtracting the energy expenses for others energy labels. This difference represents the premium in value €/sqm the building can have thanks to its energy performances as defined by Kok and Brounen as the described it as "The value of energy effiency is represented by a premium that reflects the present value of future energy savings"

| Δ(G-Energy performance rating) | | Value €/sqm | |
|---|---|---|---|
| Δ | (G-A4) | 435,53 | €/sqm |
| Δ | (G-A3) | 421,49 | €/sqm |
| Δ | (G-A2) | 393,39 | €/sqm |
| Δ | (G-A1) | 365,29 | €/sqm |
| Δ | (G-B) | 351,24 | €/sqm |
| Δ | (G-C) | 302,06 | €/sqm |
| Δ | (G-D) | 269,89 | €/sqm |
| Δ | (G-E) | 168,59 | €/sqm |
| Δ | (G-F) | 63,22 | €/sqm |
| Δ | (G-G) | 0,00 | €/sqm |

*Figure 4.1.5 Premium value based as the energy savings moving from each energy Labels and G labels as reference value.*

The results shown in *Figure 4.1.5* represents the premium value of buildings €/sqm for each energy labels taking as reference value label G. Thanks to those results we can define also the premium rent by multiplying the value by a cap rate.

The cap rate shown in *Table 4.1.6* define a series of parameters from 5,00% to 7,00%. 5,00% cap rate reflects an investment with a low risk, and so a lower return while a 7,00% reflects a higher risk and so higher returns.

| | Yield | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 5,00% | 5,25% | 5,50% | 5,75% | 6,00% | 6,25% | 6,50% | 6,75% | 7,00% |
| Label | Premium rent (€/sqm per year) | | | | | | | | |
| **A4** | 21,80 | 22,90 | 24,00 | 25,10 | 26,20 | 27,30 | 28,40 | 29,40 | 30,50 |
| **A3** | 21,10 | 22,20 | 23,20 | 24,30 | 25,30 | 26,40 | 27,40 | 28,50 | 29,60 |
| **A2** | 19,70 | 20,70 | 21,70 | 22,70 | 23,70 | 24,60 | 25,60 | 26,60 | 27,60 |
| **A1** | 18,30 | 19,20 | 20,10 | 21,10 | 22,00 | 22,90 | 23,80 | 24,70 | 25,60 |
| **B** | 17,60 | 18,50 | 19,40 | 20,20 | 21,10 | 22,00 | 22,90 | 23,80 | 24,60 |
| **C** | 15,20 | 15,90 | 16,70 | 17,40 | 18,20 | 18,90 | 19,70 | 20,40 | 21,20 |
| **D** | 13,50 | 14,20 | 14,90 | 15,60 | 16,20 | 16,90 | 17,60 | 18,30 | 18,90 |
| **E** | 8,50 | 8,90 | 9,30 | 9,70 | 10,20 | 10,60 | 11,00 | 11,40 | 11,90 |
| **F** | 3,20 | 3,40 | 3,50 | 3,70 | 3,80 | 4,00 | 4,20 | 4,30 | 4,50 |
| **G** | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |

*Figure 4.1.6 Premium Rent calculated by multiplying the Premium market value by a Cap Rate from 5,00% to 7,00%*

# 4.2 PREMIUM VALUE MODEL DEFINITION, ASSET CLASS RETAIL

In this Paragraph, will be analysed the premium value that reflects the present value of future energy savings for retails buildings. The classification for retail buildings started from an EPC that lays beneath the classification E5, that as defined by the DPR 412.92[48], are Buildings used for commercial and similar activities: such as shops, wholesale or retail stores, supermarkets and exhibitions. The EPC has been drafted in the 2016, for commercial spaces in the climate area defined as E[49].

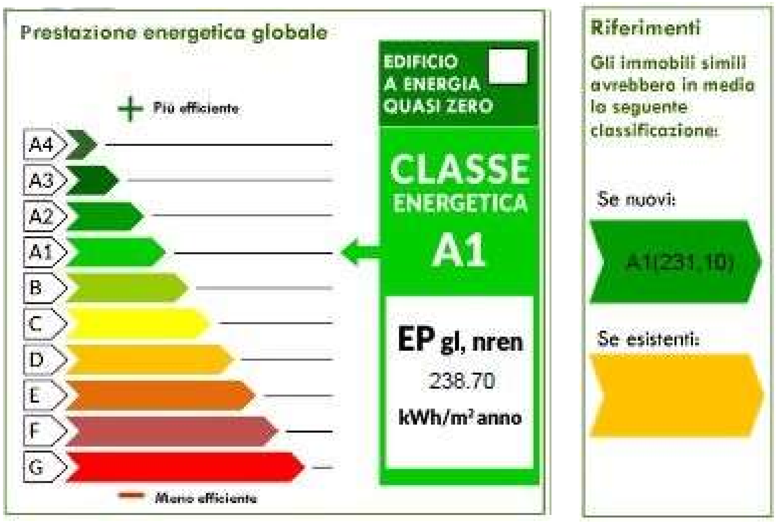



*Figure 4.2.1 Energy Performance Certificate for retail Building, took as reference for the analysis*

The energy consumptions are expressed in kWh/sqm per year and are different for each energy performance rating. Those amount shows an average of the energy

48 DPR 412/93 Art. 3 General definition of building by typology
49 DPR 412/93 Art. 2. Definition of the climate area

consumed annually in each energy label. Those amounts of energy are calculated according to the parameters given by the Italian regulation.

- A4 95,48 kWh/sqm per year
- A3 119,35 kWh/sqm per year
- A2 167,09 kWh/sqm per year
- A1 238,70 kWh/sqm per year
- B 262,57 kWh/sqm per year
- C 322,25 kWh/sqm per year
- D 417,73 kWh/sqm per year
- E 549,01 kWh/sqm per year
- F 728,04 kWh/sqm per year
- G 835,45 kWh/sqm per year

The amount of energy annually consumed for each square meter of space can be then used to define the average expense for each square meter in each energy label, by multiplying the amount of energy by an average cost of energy that, for the retail sector is assumed in 0,09 €/kWh.

In *Table 4.2.3* are shown the results of the energy cost (€/sqm) according to the different energy performance rating, per year. Starting from the more performing energy label A4 we have an expenses of € 8,59 per square meter of space, the less performing energy label is G with an annual expense of € 75,19 per sqm.

| *A4* | *A3* | *A2* | *A1* | *B* |
|---|---|---|---|---|
| €/mq<br>8,59 | €/mq<br>10,74 | €/mq<br>15,04 | €/mq<br>21,48 | €/mq<br>23,63 |
| *C* | *D* | *E* | *F* | *G* |
| €/mq<br>29,00 | €/mq<br>37,60 | €/mq<br>49,41 | €/mq<br>65,52 | €/mq<br>75,19 |

*Figure 4.2.2 Annual expenses deriving from energy cost for each energy labels*

To define how much will be the premium rent a tenant could accept to pay we can multiply the annual expenses for a period of 12 years. We have to consider that each year the annual expenses, have to be updated according to the Istat increase in prices, that we will assume in 1,8%. The period of the observation will be the same discussed in the previous Paragraph, a period of 12 years, according to *Art. 27 Law 392/78.* In *Table 4.2.3* are shown the expenses for retail buildings for a period of 12 years divided for each energy label. the energy expenses are expressed in €/sqm and vary according to the Istat increase in price.

| ***Year*** | **1** | **2** | **3** | **4** | **5** | **6** |
|---|---|---|---|---|---|---|
| **Label** | **Energy expenses (€/sqm)** | | | | | |
| **A4** | 8,75 | 8,91 | 9,07 | 9,23 | 9,39 | 9,56 |
| **A3** | 10,93 | 11,13 | 11,33 | 11,54 | 11,74 | 11,96 |
| **A2** | 15,31 | 15,58 | 15,86 | 16,15 | 16,44 | 16,74 |
| **A1** | 21,87 | 22,26 | 22,66 | 23,07 | 23,49 | 23,91 |
| **B** | 24,06 | 24,49 | 24,93 | 25,38 | 25,84 | 26,30 |
| **C** | 29,52 | 30,06 | 30,60 | 31,15 | 31,71 | 32,28 |
| **D** | 38,27 | 38,96 | 39,66 | 40,38 | 41,10 | 41,84 |
| **E** | 50,30 | 51,21 | 52,13 | 53,07 | 54,02 | 54,99 |
| **F** | 66,70 | 67,90 | 69,13 | 70,37 | 71,64 | 72,93 |
| **G** | 76,54 | 77,92 | 79,32 | 80,75 | 82,21 | 83,69 |
| ***Year*** | ***7*** | ***8*** | ***9*** | ***10*** | ***11*** | ***12*** |
| **Label** | **Energy expenses (€/sqm)** | | | | | |
| **A4** | 9,74 | 9,91 | 10,09 | 10,27 | 10,46 | 10,64 |
| **A3** | 12,17 | 12,39 | 12,61 | 12,84 | 13,07 | 13,31 |
| **A2** | 17,04 | 17,35 | 17,66 | 17,98 | 18,30 | 18,63 |
| **A1** | 24,34 | 24,78 | 25,22 | 25,68 | 26,14 | 26,61 |
| **B** | 26,77 | 27,26 | 27,75 | 28,25 | 28,75 | 29,27 |
| **C** | 32,86 | 33,45 | 34,05 | 34,67 | 35,29 | 35,93 |
| **D** | 42,60 | 43,36 | 44,14 | 44,94 | 45,75 | 46,57 |
| **E** | 55,98 | 56,99 | 58,02 | 59,06 | 60,12 | 61,21 |

| *Year* | *7* | *8* | *9* | *10* | *11* | *12* |
|---|---|---|---|---|---|---|
| **Label** | **Energy expenses (€/sqm)** | | | | | |
| **F** | 74,24 | 75,57 | 76,94 | 78,32 | 79,73 | 81,16 |
| **G** | 85,19 | 86,73 | 88,29 | 89,88 | 91,49 | 93,14 |

*Figure 4.2.3 Energy expenses calculated over 12 years,*
*Energy cost are updated according to ISTAT index.*

As, has been done in *Paragraph 4.1* the value obtained in *Table 4.2.3* cannot be used as they are, but must be discounted using the Net Present Value formula, to define the actual value of future cash flows. The discount rate used in the NPV is 7,11%, calculated as has been done before in *Paragraph 4.1* as the sum of risk free and risk premium.

The Net Present Value calculated for each energy class are reported in *Table 4.2.4*, as we can see the "today value" of expenses for a building labelled as A4 is € 75,24 sqm, while for a poor performing one is € 658,38 sqm.

| **Energy performance rating** | **Expenses** |
|---|---|
| NPV A4 Class | 75,24 €/sqm |
| NPV A3 Class | 94,05 €/sqm |
| NPV A2 Class | 131,68 €/sqm |
| NPV A1 Class | 188,11 €/sqm |
| NPV B Class | 206,92 €/sqm |
| NPV C Class | 253,95 €/sqm |
| NPV D Class | 329,19 €/sqm |
| NPV E Class | 432,65 €/sqm |
| NPV F Class | 573,73 €/sqm |
| NPV G Class | 658,38 €/sqm |

*Figure 4.2.4 Net Present Value (NPV) of the energy expenses, for each energy labels*

To define the future savings deriving from energy labels should be used the values obtained in *Table 4.2.4*. Defining as reference G label, the premium value is defined as difference between the future expenses of the least performing energy rates and the label under analysis.

| **Δ(G-Energy performance rating)** | **Value €/sqm** |
|---|---|
| Δ (G-A4) | 583,14 €/sqm |
| Δ (G-A3) | 564,33 €/sqm |
| Δ (G-A2) | 526,71 €/sqm |
| Δ (G-A1) | 470,27 €/sqm |
| Δ (G-B) | 451,46 €/sqm |
| Δ (G-C) | 404,44 €/sqm |
| Δ (G-D) | 329,19 €/sqm |
| Δ (G-E) | 225,73 €/sqm |
| Δ (G-F) | 84,65 €/sqm |
| Δ (G-G) | 0,00 €/sqm |

*Figure 4.2.5 Premium value based as the energy savings moving from each energy Labels and G labels as reference value.*

The energy savings according to the model, return the value showed in *Figure 4.2.5*, those value, represent the premium value of the buildings according to the energy efficiency.

Then, according to the value obtained in *Table 4.2.5* is possible to define the premium rents for buildings, by multiplying the premium value for a cap rate. The series of cap rate are defined from 5,50% to 7,50%, as described in *Paragraph 4.1* a lower cap rate reflect a less risky investment while an higher one, reflects a riskier one. The value expressed in *Figure 4.2.6* represents the premium rent expressed in €/sqm per year.

| | Yield | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **5,50%** | **5,75%** | **6,00%** | **6,25%** | **6,50%** | **6,75%** | **7,00%** | **7,25%** | **7,50%** |
| **Label** | **Premium rent (€/sqm per year)** | | | | | | | | |
| **A4** | 32,10 | 33,60 | 35,00 | 36,50 | 38,00 | 39,40 | 40,90 | 42,30 | 43,80 |
| **A3** | 31,10 | 32,50 | 33,90 | 35,30 | 36,70 | 38,10 | 39,60 | 41,00 | 42,40 |
| **A2** | 29,00 | 30,30 | 31,70 | 33,00 | 34,30 | 35,60 | 36,90 | 38,20 | 39,60 |
| **A1** | 25,90 | 27,10 | 28,30 | 29,40 | 30,60 | 31,80 | 33,00 | 34,10 | 35,30 |
| **B** | 24,90 | 26,00 | 27,10 | 28,30 | 29,40 | 30,50 | 31,70 | 32,80 | 33,90 |
| **C** | 22,30 | 23,30 | 24,30 | 25,30 | 26,30 | 27,30 | 28,40 | 29,40 | 30,40 |
| **D** | 18,20 | 19,00 | 19,80 | 20,60 | 21,40 | 22,30 | 23,10 | 23,90 | 24,70 |
| **E** | 12,50 | 13,00 | 13,60 | 14,20 | 14,70 | 15,30 | 15,90 | 16,40 | 17,00 |
| **F** | 4,70 | 4,90 | 5,10 | 5,30 | 5,60 | 5,80 | 6,00 | 6,20 | 6,40 |
| **G** | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |

*Figure 4.2.6 Premium Rent calculated by multiplying the Premium market value by a Cap Rate from 5,50% to 7,50%*

# 4.3 PREMIUM VALUE MODEL DEFINITION, ASSET CLASS RESIDENTIAL

The aim of this section is investigating the premium value and then the premium rent for building with an intended use as residential. According to the Italian law, the analysis for the residential asset class started from an EPC drafted under the classification "E1" defined in the DPR 412/92[50] as: E.1 houses used as permanent residences, such as civil and rural buildings, colleges, convents, houses of sentence, barracks. The EPC has been drafted in the 2017, for residential building in the climate area defined as E[51].

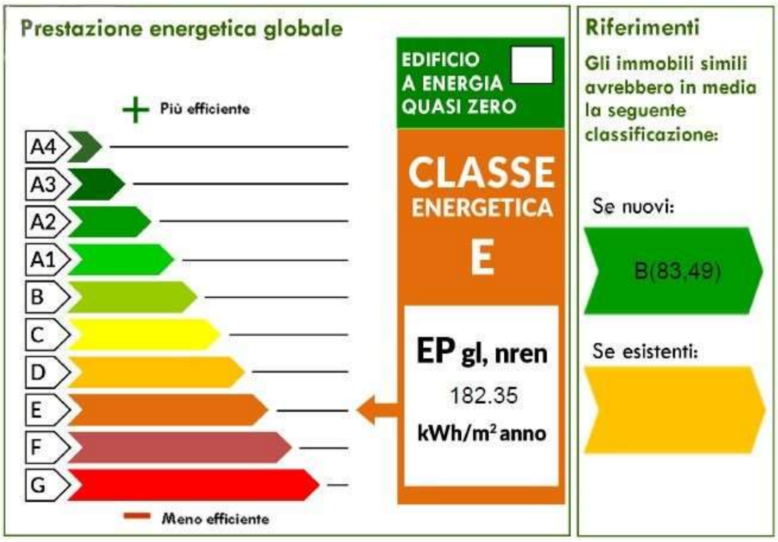



*Figure 4.3.1 Energy Performance Certificate for residential Buildings, took as reference for the analysis*

Following what has been done in the previous *Paragraph 4.1* and *4.2*, according to the parameters defined in the legislation is possible to define the expected consumes for the energy performance rating that will in:

[50] DPR 412/93 Art. 3 General definition of building by typology
[51] DPR 412/93 Art. 2. Definition of the climate area

- A4 31,71 kWh/sqm per year
- A3 39,64 kWh/sqm per year
- A2 55,50 kWh/sqm per year
- A1 71,35 kWh/sqm per year
- B 87,21 kWh/sqm per year
- C 107,03 kWh/sqm per year
- D 138,74 kWh/sqm per year
- E 182,35 kWh/sqm per year
- F 241,81 kWh/sqm per year
- G 277,49 kWh/sqm per year

The amount of energy annually consumed for each square meter of space can be then used to define the average price for each square meter in each energy label, by multiplying the amount of energy by an average cost of energy that for the residential asset class is assumed in 0,15 €/kWh.

In *Table 4.2.3* are shown the results of the energy cost (€/sqm) according to the different energy performance rating, per year. Starting from the more performing energy label A4 we have an annual expense of € 4,76 per square meter of space, while the less performing energy label is G with an annual expense of € 41,62 per sqm. The results for each labels are shown in the above *Table 4.3.2*.

| ***A4*** | ***A3*** | ***A2*** | ***A1*** | ***B*** |
|---|---|---|---|---|
| €/sqm<br>4,76 | €/sqm<br>5,95 | €/sqm<br>8,32 | €/sqm<br>10,70 | €/sqm<br>13,08 |
| ***C*** | ***D*** | ***E*** | ***F*** | ***G*** |
| €/sqm<br>16,05 | €/sqm<br>20,81 | €/sqm<br>27,35 | €/sqm<br>36,27 | €/sqm<br>41,62 |

*Figure 4.3.2 Annual expenses deriving from energy cost for each energy labels*

The annual expenses as calculated in *Table 4.3.2* shall be multiplied for a 8 years period according to the provision defined in the Italian legislation, as described at the beginning of *Chapter 4.* In fact, as defined by law 392/78 standard duration for lease for residential buildings is 4 years with the tacit renewal, that increase the contract for 4 years more. For each year, the value is going to be update by the Istat increase in prices assumed in 1,80%.

In *Table 4.3.3* are shown the annual expense, expressed in €/sqm per year, for the period that last for 8 years. the energy expenses has been defined for each energy label according to the previous data shown in *Table 4.3.2* and updated according to the Istat adjustment that has been considered equal to 1,80%.

| *Year* | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* | ⊚ |
|---|---|---|---|---|---|---|---|---|---|
| *Label* | *Energy expenses (€/sqm)* | | | | | | | | |
| **A4** | 4,84 | 4,93 | 5,02 | 5,11 | 5,20 | 5,29 | 5,39 | 5,49 | **41,27** |
| **A3** | 6,05 | 6,16 | 6,27 | 6,39 | 6,50 | 6,62 | 6,74 | 6,86 | **51,59** |
| **A2** | 8,47 | 8,63 | 8,78 | 8,94 | 9,10 | 9,27 | 9,43 | 9,60 | **72,22** |
| **A1** | 10,90 | 11,09 | 11,29 | 11,49 | 11,70 | 11,91 | 12,13 | 12,35 | **92,86** |
| **B** | 13,32 | 13,56 | 13,80 | 14,05 | 14,30 | 14,56 | 14,82 | 15,09 | **113,50** |
| **C** | 16,34 | 16,64 | 16,94 | 17,24 | 17,55 | 17,87 | 18,19 | 18,52 | **139,29** |
| **D** | 21,19 | 21,57 | 21,96 | 22,35 | 22,75 | 23,16 | 23,58 | 24,00 | **180,56** |
| **E** | 27,84 | 28,35 | 28,86 | 29,38 | 29,90 | 30,44 | 30,99 | 31,55 | **237,31** |
| **F** | 36,92 | 37,59 | 38,27 | 38,95 | 39,66 | 40,37 | 41,10 | 41,84 | **314,69** |
| **G** | 42,37 | 43,14 | 43,91 | 44,70 | 45,51 | 46,33 | 47,16 | 48,01 | **361,12** |

*Figure 4.3.3 Energy expenses calculated over 8 years, Energy cost are updated according to ISTAT index.*

As, has been done in *Paragraphs 4.1* and *4.2* the value obtained in *Table 4.3.3* should not be used as they are, but must be discounted using the Net Present Value formula, to define the actual value of future cash flows. The discount rate applied in the NPV formula is 7,11%, calculated as the sum of risk free and risk premium as did in *Paragraph 4.1*.

The Net Present Value reported in *Table 4.2.4* shows the present value of future expenses for building labelled according to the Italian legislation.

| Energy performance rating | Expenses |
|---|---|
| NPV A4 Class | 30,48 €/sqm |
| NPV A3 Class | 38,10 €/sqm |
| NPV A2 Class | 53,34 €/sqm |
| NPV A1 Class | 68,58 €/sqm |
| NPV B Class | 83,82 €/sqm |
| NPV C Class | 102,86 €/sqm |
| NPV D Class | 133,34 €/sqm |
| NPV E Class | 175,25 €/sqm |
| NPV F Class | 232,40 €/sqm |
| NPV G Class | 266,69 €/sqm |

*Figure 4.3.4 Net Present Value (NPV) of the energy expenses, for each energy labels*

According to the data shown in *Table 4.3.4* we can see that the Net present value of expenses for a building in G class is 266,69 €/sqm. Setting as reference the G Energy performance rating expenses we can define the premium value for others energy labels. In fact, this difference represents the increase in value €/sqm the building can have thanks to their energy performances.

| Δ(G-Energy performance rating) | Value €/sqm |
|---|---|
| Δ (G-A4) | 236,21 €/sqm |
| Δ (G-A3) | 228,59 €/sqm |
| Δ (G-A2) | 213,35 €/sqm |
| Δ (G-A1) | 198,11 €/sqm |
| Δ (G-B) | 182,87 €/sqm |
| Δ (G-C) | 163,82 €/sqm |
| Δ (G-D) | 133,34 €/sqm |
| Δ (G-E) | 91,44 €/sqm |
| Δ (G-F) | 34,29 €/sqm |
| Δ (G-G) | 0,00 €/sqm |

*Figure 4.3.5 Premium value based as the energy savings moving from each energy Labels and G labels as reference value.*

As we can see numbers contained in *Figure 4.3.5*, are precisely what has been defined by Brounen and Kok and analysed in *Chapter 3.2* as the premium coming from the present value of future energy savings.

According to this model we can also give a basic reference value for the increase in value of the renting price of the buildings. We can in fact define a series of Cap Rate by whom multiplying the value €/sqm from *Table 4.3.5*, to obtain the increase of rental price.

| | Yield | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **6,00%** | **6,25%** | **6,50%** | **6,75%** | **7,00%** | **7,25%** | **7,50%** | **7,75%** | **8,00%** |
| **Label** | **Premium rent (€/sqm per year)** | | | | | | | | |
| **A4** | 14,20 | 14,80 | 15,40 | 16,00 | 16,60 | 17,20 | 17,80 | 18,40 | 18,90 |
| **A3** | 13,80 | 14,30 | 14,90 | 15,50 | 16,10 | 16,60 | 17,20 | 17,80 | 18,30 |
| **A2** | 12,90 | 13,40 | 13,90 | 14,50 | 15,00 | 15,50 | 16,10 | 16,60 | 17,10 |
| **A1** | 11,90 | 12,40 | 12,90 | 13,40 | 13,90 | 14,40 | 14,90 | 15,40 | 15,90 |
| **B** | 11,00 | 11,50 | 11,90 | 12,40 | 12,90 | 13,30 | 13,80 | 14,20 | 14,70 |
| **C** | 9,90 | 10,30 | 10,70 | 11,10 | 11,50 | 11,90 | 12,30 | 12,70 | 13,20 |
| **D** | 8,10 | 8,40 | 8,70 | 9,10 | 9,40 | 9,70 | 10,10 | 10,40 | 10,70 |
| **E** | 5,50 | 5,80 | 6,00 | 6,20 | 6,50 | 6,70 | 6,90 | 7,10 | 7,40 |
| **F** | 2,10 | 2,20 | 2,30 | 2,40 | 2,50 | 2,50 | 2,60 | 2,70 | 2,80 |
| **G** | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |

*Figure 4.3.6 Premium Rent calculated by multiplying the Premium market value by a Cap Rate from 6,00% to 8,00%*

## 4.4 PREMIUM VALUE MODEL DEFINITION, ASSET CLASS OFFICE AND RETAIL BEFORE 2015

The analysis of the previous pages, could only be applied to cases of building with an Energy Performance Certificate, that has been drafted after the new law of 2015, and so it keeps into account labels from A4 to G. The legislation that has been applied to building from 2005 on, took into account only labels from A+ to G, and the parameter of the Energy Performance Certificate were different, in fact, winter heating and summer cooling were considered in two different parts of the certification. Another important point, is that before 2015 energy consumption for tertiary building was considered in kWh/m$^3$ and not in kWh/m$^2$ as it is today.

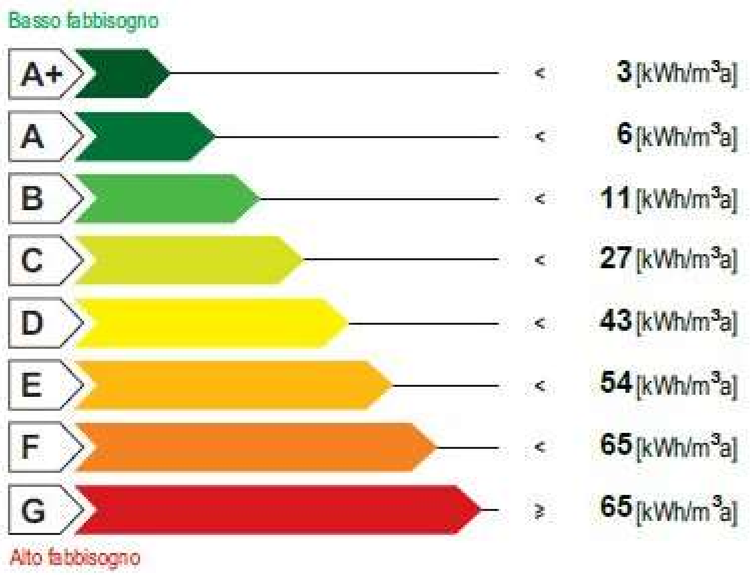



*Figure 4.4.1 Winter heating consumes, taken from an Energy performance certificate*

The energy requirements for building are synthetized in *Figure 4.4.1*, as it was specified in *Chapter 1*, before 2015, parameters of the energy consumption, were fixed and the concept of reference building was still not introduced.

The price considered for energy is forecasted in 0,09 €/kWh. In *Table 4.4.2* are shown the energy cost (€/$m^3$) according to the different energy performance rating, per year. Differently from the previous example, in this paragrapg, the cost are expressed in € per cubic meter, this difference together with the absence of the energy expenses of the summer cooling will make those costs appear lower than the previously cases analysed for the regulation after the 2015.

| Energy performance rating | Expenses |
|---|---|
| A+ | 0,3 €/$m^3$ |
| A | 0,4 €/$m^3$ |
| B | 0,8 €/$m^3$ |
| C | 1,7 €/$m^3$ |
| D | 3,2 €/$m^3$ |
| E | 4,4 €/$m^3$ |
| F | 5,4 €/$m^3$ |
| G | 5,9 €/$m^3$ |

*Figure 4.4.2 Annual energy expenses for winter heating, defined in €/cubic meter, calculated from the Energy Performance Certificate*

The same methodology applied in the previous paragraphs can be applied in this analysis. The annual expenses (€/cm), shall be updated according to the Istat increase of prices that has been considered as reference value 1,8%. The period of the analysis is 12 years, the typical duration of a rental agreement in Italy as mentioned in *Paragraph 4.1* and *4.2*.

To define the today value of the future expenses, we will apply the same methodology used in the previous paragraphs, where we used the Net Present Value formula to determine which will be the today value of future savings, for a period of 12 years. In the Net present value, the interest rate is equal to 7,11%.

The results obtained are synthetized in *Table 4.4.3*.

| Energy performance rating | Expenses | |
|---|---|---|
| NPV A+ Class | 2,36 | €/cm |
| NPV A Class | 3,55 | €/cm |
| NPV B Class | 6,70 | €/cm |
| NPV C Class | 14,97 | €/cm |
| NPV D Class | 27,58 | €/cm |
| NPV E Class | 38,22 | €/cm |
| NPV F Class | 46,89 | €/cm |
| NPV G Class | 51,22 | €/cm |

*Figure 4.4.3 Net Present Value of Future energy expenses for winter heating calculated for each energy label*

According to the data shown in *Table 4.4.3* we can see that the Net present value of expenses for a building in G class is 51.22 €/cm, this value may seem low, but the reason is due to the expenses considered in cubic meters. Setting as reference the G Energy performance rating expenses we can define the future savings for each energy labels. In fact, this difference represents the increase in value €/sqm the building can have thanks to his energy performances.

| Δ(G-Energy performance rating) | | Value €/sqm | |
|---|---|---|---|
| Δ | (G-A+) | 48,86 | €/cm |
| Δ | (G-A) | 47,68 | €/cm |
| Δ | (G-B) | 44,53 | €/cm |
| Δ | (G-C) | 36,25 | €/cm |
| Δ | (G-D) | 23,64 | €/cm |
| Δ | (G-E) | 13,00 | €/cm |
| Δ | (G-F) | 4,33 | €/cm |
| Δ | (G-G) | 0,00 | €/cm |

*Figure 4.4.4 Premium value based as the energy savings, for winter heating moving from each energy Labels and G labels as reference value.*

As mentioned at the beginning of the paragraph, the EPC drafted before the 2015 do not take into account factors like the quantity of energy required for summer colling, production of domestic hot water and lighting consumption. On top of that, the value expressed are in € per cubic meter a year, which makes them appear lower than they really are. Just to make an example from a real case:

-Heated area: 391 sqm

-Heated volume: 1623

In this case the volume is more than 4 times bigger than the area, so the value from *Tables 4.4.4*, should be multiplied by 4,15 to make a comparison, with the one from the previous paragraphs that evaluated the future energy savings as €/sqm and not in €/cm.

To evaluate the summer cooling in the EPC drafted before the 2015 there was another Energy performance rating divided in the same 8 classes from A+ to G. The

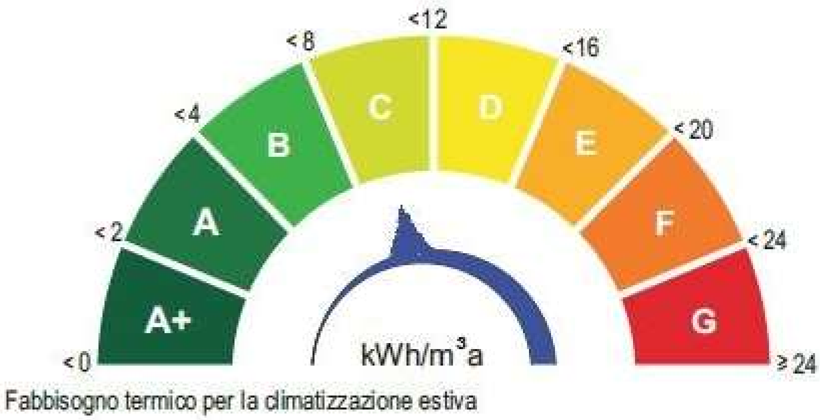



*Figure 4.4.5 Summer cooling consumes, taken from an Energy performance certificate*

process of analysis will be the same analysed before.

The analysis will start with a focus on the energy price for each cubic meter of space. The price of energy is considered as 0,09 €/kWh.

| Energy performance rating | Expenses |
|---|---|
| A+ | 0,2 €/cm |
| A | 0,3 €/cm |
| B | 0,5 €/cm |
| C | 0,9 €/cm |
| D | 1,3 €/cm |
| E | 1,6 €/cm |
| F | 2,0 €/cm |
| G | 2,2 €/cm |

*Figure 4.4.6 Annual energy expenses for summer cooling, defined in €/cubic meter, calculated from the Energy Performance Certificate*

Then as analysed before the NPV of a 12 year expenses for the summer cooling are defined in *Table 4.4.7*:

| **Energy performance rating** | **Expenses** | |
|---|---|---|
| NPV A+ Class | 1,58 | €/cm |
| NPV A Class | 2,36 | €/cm |
| NPV B Class | 4,73 | €/cm |
| NPV C Class | 7,88 | €/cm |
| NPV D Class | 11,03 | €/cm |
| NPV E Class | 14,19 | €/cm |
| NPV F Class | 17,34 | €/cm |
| NPV G Class | 18,91 | €/cm |

*Figure 4.4.7 Net Present Value of Future energy expenses for summer cooling calculated for each energy label*

Setting as reference the G class we can obtain the value of each cm of space for our building or building units as defined in *Table 4.4.8*:

| **Δ(G-Energy performance rating)** | | **Value €/sqm** | |
|---|---|---|---|
| Δ | (G-A+) | 17,34 | €/cm |
| Δ | (G-A) | 16,55 | €/cm |
| Δ | (G-B) | 14,19 | €/cm |
| Δ | (G-C) | 11,03 | €/cm |
| Δ | (G-D) | 7,88 | €/cm |
| Δ | (G-E) | 4,73 | €/cm |
| Δ | (G-F) | 1,58 | €/cm |
| Δ | (G-G) | 0,00 | €/cm |

*Figure 4.4.8 Premium value based as the energy savings, for winter heating moving from each energy Labels and G labels as reference value.*

The sum of values obtained in *Figure 4.4.8* with *Figure 4.4.4*, can give reference value to define the increase in value for each energy performance rating. The two tables are not merged into one, due to the fact that, although is not very common, some EPC have two different Energy performance rating for winter heating and summer cooling, like the one in *Figure 4.4.9* where the energy performance rating for Winter heating is D, while summer heating is A.


*Figure 4.4.9 Energy Performance Certificate sample showing a difference between Winter and Summer Energy Labels*

# Chapter 5

# APPLICATION OF A PREMIUM RENT TO CASE STUDIES

The aim of this chapter is to evaluate how much the energy performances of buildings can boost the value of a building by the viewpoint of an investor to understand the today value of a future investment, considering the value of money over time. The analysis about the premium rent has been conducted through Discounted Cash Flow model. The analysis starts from an average base market rent, that is going to be increased according to a premium as foreseen in the *Chapter 4*. The buildings have been analysed twice, in the first case, in their actual energy performance label, and then as if they were in a more performing energy rating. The aim is verify if the Net Present Value of the Future cash flows reflects the value that have been analysed in *Chapter 4*.

## 5.1 CASE 1, VIA ETTORE ROMAGNOLI

The case under analysis is a building in the City of Milan, located in Via Ettore Romagnoli. The building is actually labelled as D in its Energy Performance Certificate. The EPC specify that if the building should be newly constructed it would be labelled as B. So the analysis would foresee two scenarios, the first one represents the Building as it is, D labelled, and then in second scenario as it would be if labelled as a new one, evaluating which would be the value of the building according to the parameters defined in the *Chapter 4*.

Most of the premises are common for both buildings:

- The time of the analysis is set in 10 years;
- Istat Rent price adjustment, is considered equal to 1,80%, and updated only by 75% of the adjustment, as foreseen by law 392/1978 in article 32[52];
- The discount rate of the DCF is considered as 7,11%, as sum of the additional risk premium equal to 6,5% and 1,61% equal to IRS yield (value at 14/11/2017);
- IMU equal to € 329.000;
- Insurance equal to € 10.949;
- Property Management expenses 1,00% of the revenues;
- Extraordinary maintenance 0,60% of the revenues;
- Contract registration equal to 0,50% of the revenues;
- Uncollectable rents equal to 5% of the location revenues;
- Market rent for Case in energy performance rating B is equal to: 216,60 €/sqm year (defined as Average Base Market rent equal to 192€/sqm + Premium rent

52 Art.32. (Rent Update). The parties may agree that the rent is updated. The increase in the rent cannot exceed the 75% of the, of the ISTAT consumer price index for the families, workers and employees.

equal to 24,60 €/sqm defined by yield equal to 7,00% from data defined in *Table 4.1.6*)

- Market rent for Case in energy performance rating B is equal to: 210,90 €/sqm year (defined as Average base market rent equal to 192€/sqm + Premium rent 18,90 €/sqm defined by yield equal to 7,00% from data defined in *Table 4.1.6*)
- The exit cap rate is considered as 7%.

Building in energy label D

MILANO (MI) VIA ETTORE ROMAGNOLI 6

| | | |
|---|---|---|
| **Commercial Area** | **11.432** | Percentuale |
| Non-rented Area | 2.367 | 20,70% |
| Rented Area | 9.065 | 79,30% |
| Passing Rent (€/sqm/year) | 214 | |
| Passing Rent (€/year) | **1.937.765** | |

| | STABILIZED | AREA | MR/AREA | MR | Year: 31/12/2018 | 31/12/2019 | 31/12/2020 | 31/12/2021 | 31/12/2022 | 31/12/2023 | 31/12/2024 | 31/12/2025 | 31/12/2026 | 31/12/2027 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Tenant* | **RENT** | *(sqm)* | *(€/sqm/yr)* | *(MR €/yr)* | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **Total** |
| | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| **BANCA POPOLARE DELL'EMILIA ROMAGNA** | 113.000 | 434 | 210,90 | 91.531 | 114.526 | 116.072 | 117.639 | 119.227 | 97.878 | 99.199 | 100.539 | 101.896 | 103.271 | 104.666 | **1.074.911** |
| | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| **RISTOMI SRL** | 110.743 | 432 | 210,90 | 91.109 | 112.238 | 113.753 | 113.586 | 96.129 | 97.427 | 98.742 | 100.075 | 101.426 | 102.796 | 104.183 | **1.040.355** |
| | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| **EAGLE PICTURE SPA** | 164.105 | 731 | 210,90 | 154.210 | 166.320 | 162.637 | 160.540 | 162.708 | 164.904 | 167.130 | 169.387 | 171.673 | 173.991 | 176.340 | **1.675.630** |
| | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| **SAINT-GOBAIN GLASS ITALIA SPA** | 1.143.370 | 5.608 | 210,90 | 1.182.643 | 1.158.805 | 1.174.449 | 1.190.304 | 1.206.374 | 1.264.656 | 1.281.729 | 1.299.032 | 1.316.569 | 1.334.343 | 1.352.356 | **12.578.618** |
| | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| **VODAFONE OMNITEL BV** | 15.547 | 38 | 400 | 15.200 | 15.757 | 15.970 | 16.185 | 16.404 | 16.625 | 16.850 | 16.696 | 16.921 | 17.150 | 17.381 | **165.938** |
| | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| **COSNOVA ITALIA SRL** | 114.000 | 605 | 210,90 | 127.616 | 115.539 | 117.099 | 118.680 | 120.282 | 129.185 | 138.308 | 140.175 | 142.067 | 143.985 | 145.929 | **1.311.248** |
| | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| **AKKA ITALIA SRL** | 262.000 | 1.182 | 210,90 | 249.284 | 265.537 | 269.122 | 272.755 | 276.437 | 277.903 | 270.170 | 273.817 | 277.513 | 281.260 | 285.057 | **2.749.570** |
| | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| **GALATA SPA** | 15.000 | 35 | 400 | 14.000 | 15.203 | 15.408 | 15.616 | 15.827 | 16.040 | 16.257 | 15.378 | 15.585 | 15.796 | 16.009 | **157.118** |
| | | | | | 0% | 16% | 38% | 46% | 50% | 50% | 50% | 50% | 50% | 50% | |
| **VACANT** | 0 | 2.367 | 210,90 | 499.116 | 0 | 83.311 | 194.852 | 244.549 | 266.864 | 270.467 | 274.118 | 277.819 | 281.569 | 285.370 | **2.178.919** |
| **Total Revenues** | **1.937.765** | | | | **1.963.925** | **2.067.820** | **2.200.156** | **2.257.935** | **2.331.483** | **2.358.851** | **2.389.216** | **2.421.470** | **2.454.160** | **2.487.291** | **22.932.307** |
| IMU | 329172 | | | | 333.616 | 338.120 | 342.684 | 347.310 | 351.999 | 356.751 | 361.567 | 366.448 | 371.396 | 376.409 | 3.546.301 |
| Insurance | 10.949 | | | | 11.097 | 11.247 | 11.398 | 11.552 | 11.708 | 11.866 | 12.027 | 12.189 | 12.353 | 12.520 | 117.958 |
| Property Mng | 1,00% | | | | 19.639 | 20.678 | 22.002 | 22.579 | 23.315 | 23.589 | 23.892 | 24.215 | 24.542 | 24.873 | 229.323 |
| Extraordinary maintenance | 0,60% | | | | 11.784 | 12.407 | 13.201 | 13.548 | 13.989 | 14.153 | 14.335 | 14.529 | 14.725 | 14.924 | 137.594 |
| Contract registration | 0,50% | | | | 9.820 | 10.339 | 11.001 | 11.290 | 11.657 | 11.794 | 11.946 | 12.107 | 12.271 | 12.436 | 114.662 |
| Uncollectable rents | 5% | | | | 98.196 | 103.391 | 110.008 | 112.897 | 116.574 | 117.943 | 119.461 | 121.074 | 122.708 | 124.365 | |
| **Total cost** | | | | | **484.151** | **496.181** | **510.294** | **519.176** | **529.243** | **536.096** | **543.228** | **550.562** | **557.994** | **565.527** | 5.292.453 |
| **Net Revenues** | | | | | **1.479.774** | **1.571.638** | **1.689.862** | **1.738.759** | **1.802.240** | **1.822.755** | **1.845.988** | **1.870.909** | **1.896.166** | **1.921.764** | **17.639.854** |
| | ***Gross*** | | | | | | | | | | | | | | |
| *Terminal Value* | 7,00% | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 35.532.735 | 35.532.735 |
| ***FCFO*** | | | | | **1.479.774** | **1.571.638** | **1.689.862** | **1.738.759** | **1.802.240** | **1.822.755** | **1.845.988** | **1.870.909** | **1.896.166** | **37.454.499** | 53.172.589 |
| **NPV** | **€ 30.021.742** | | NPV/sqm | 2626 | | | | | | | | | | | |

*Figure 5.1.1 Discounted Cash Flow Model applied on a 10 years analysis for a office building in D label*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Building in energy label B** | | | | | | | | | | | | | | | |
| **MILANO (MI) VIA ETTORE ROMAGNOLI 6** | | | | | | | | | | | | | | | |
| **Commercial Area** | **11.432** | | Percentage (%) | | | | | | | | | | | | |
| Non-rented Area | 2.367 | | 20,70% | | | | | | | | | | | | |
| Rented Area | 9.065 | | 79,30% | | | | | | | | | | | | |
| Passing Rent (€/sqm/year) | 214 | | | | | | | | | | | | | | |
| Passing Rent (€/year) | 1.937.765 | | | | | | | | | | | | | | |
| | | | | | *Year:* | | | | | | | | | | |
| | | | | | 31/12/2018 | 31/12/2019 | 31/12/2020 | 31/12/2021 | 31/12/2022 | 31/12/2023 | 31/12/2024 | 31/12/2025 | 31/12/2026 | 31/12/2027 | |
| | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | **Total** |
| | **STABILIZED** | **AREA** | **MR/AREA** | **MR** | | | | | | | | | | | |
| *Tenant* | **RENT** | *(sqm)* | *(€/sqm/yr)* | *(MR €/yr)* | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| **BANCA POPOLARE DELL'EMILIA ROMAGNA** | 113.000 | 434 | 216,60 | 94.004 | 114.526 | 116.072 | 117.639 | 119.227 | 100.523 | 101.880 | 103.256 | 104.650 | 106.063 | 107.494 | **1.091.329** |
| | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| **RISTOMI SRL** | 110.743 | 432 | 216,60 | 93.571 | 112.238 | 113.753 | 113.799 | 98.727 | 100.060 | 101.411 | 102.780 | 104.167 | 105.574 | 106.999 | **1.059.509** |
| | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| **EAGLE PICTURE SPA** | 164.105 | 731 | 216,60 | 158.378 | 166.320 | 165.134 | 164.879 | 167.105 | 169.361 | 171.647 | 173.965 | 176.313 | 178.693 | 181.106 | **1.714.524** |
| | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| **SAINT-GOBAIN GLASS ITALIA SPA** | 1.143.370 | 5.608 | 216,60 | 1.214.606 | 1.158.805 | 1.174.449 | 1.190.304 | 1.206.374 | 1.298.836 | 1.316.370 | 1.334.141 | 1.352.152 | 1.370.406 | 1.388.906 | **12.790.744** |
| | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| **VODAFONE OMNITEL BV** | 15.547 | 38 | 400 | 15.200 | 15.757 | 15.970 | 16.185 | 16.404 | 16.625 | 16.850 | 16.696 | 16.921 | 17.150 | 17.381 | **165.938** |
| | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| **COSNOVA ITALIA SRL** | 114.000 | 605 | 216,60 | 131.065 | 115.539 | 117.099 | 118.680 | 120.282 | 131.030 | 142.046 | 143.963 | 145.907 | 147.877 | 149.873 | **1.332.294** |
| | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| **AKKA ITALIA SRL** | 262.000 | 1.182 | 216,60 | 256.021 | 265.537 | 269.122 | 272.755 | 276.437 | 279.103 | 277.472 | 281.217 | 285.014 | 288.862 | 292.761 | **2.788.280** |
| | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| **GALATA SPA** | 15.000 | 35 | 400 | 14.000 | 15.203 | 15.408 | 15.616 | 15.827 | 16.040 | 16.257 | 15.378 | 15.585 | 15.796 | 16.009 | **157.118** |
| | | | | | 0% | 16% | 38% | 46% | 50% | 50% | 50% | 50% | 50% | 50% | |
| **VACANT** | 0 | 2.367 | 216,60 | 512.606 | 0 | 85.563 | 200.118 | 251.158 | 274.077 | 277.777 | 281.527 | 285.327 | 289.179 | 293.083 | **2.237.808** |
| **Total Revenues** | **1.937.765** | | | | **1.963.925** | **2.072.569** | **2.209.975** | **2.271.540** | **2.385.655** | **2.421.709** | **2.452.923** | **2.486.037** | **2.519.599** | **2.553.613** | **23.337.544** |
| IMU | 329172 | | | | 333.616 | 338.120 | 342.684 | 347.310 | 351.999 | 356.751 | 361.567 | 366.448 | 371.396 | 376.409 | 3.546.301 |
| Insurance | 10.949 | | | | 11.097 | 11.247 | 11.398 | 11.552 | 11.708 | 11.866 | 12.027 | 12.189 | 12.353 | 12.520 | 117.958 |
| Property Mng | 1,00% | | | | 19.639 | 20.726 | 22.100 | 22.715 | 23.857 | 24.217 | 24.529 | 24.860 | 25.196 | 25.536 | 233.375 |
| Extraordinary maintenance | 0,60% | | | | 11.784 | 12.435 | 13.260 | 13.629 | 14.314 | 14.530 | 14.718 | 14.916 | 15.118 | 15.322 | 140.025 |
| Contract registration | 0,50% | | | | 9.820 | 10.363 | 11.050 | 11.358 | 11.928 | 12.109 | 12.265 | 12.430 | 12.598 | 12.768 | 116.688 |
| Uncollectable rents | 5% | | | | 98.196 | 103.628 | 110.499 | 113.577 | 119.283 | 121.085 | 122.646 | 124.302 | 125.980 | 127.681 | |
| **Total cost** | | | | | **484.151** | **496.519** | **510.991** | **520.142** | **533.089** | **540.559** | **547.751** | **555.146** | **562.640** | **570.236** | 5.321.225 |
| **Net Revenues** | | | | | **1.479.774** | **1.576.050** | **1.698.984** | **1.751.398** | **1.852.566** | **1.881.150** | **1.905.171** | **1.930.891** | **1.956.958** | **1.983.377** | **18.016.319** |
| | ***Lordo*** | | | | | | | | | | | | | | |
| *Terminal Value* | 7,00% | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 36.480.187 | 36.480.187 |
| ***FCFO*** | | | | | **1.479.774** | **1.576.050** | **1.698.984** | **1.751.398** | **1.852.566** | **1.881.150** | **1.905.171** | **1.930.891** | **1.956.958** | **38.463.564** | 54.496.506 |
| **NPV** | **€ 30.728.677** | | NPV/sqm | | 2688 | | | | | | | | | | |

*Figure 5.1.2 Discounted Cash Flow Model applied on a 10 years analysis for a office building in B label*

As is possible to see from *Table 5.1.1* according to the Discounted Cash Flow the Net Present Value of the building in Case A (the one labelled as D), generated by the cash flow over 10 years is € 30.000.000,00. The NPV for the second case is € 30.700.000,00. The value of the Building in both scenarios, is a value that subtracted from the NPV, still gives as an outcome a positive NPV and an Internal Rate of Return (IRR) that is in line with the expectations of the investors. Considering the nature of the asset its specific asset class, the tenancy and the location, the value of the Building, would be just a small amount lower than the NPV.

In the two case we can divide the NPV by the total area to obtain the parameter divided by the square meter of the asset, in the two cases. In the first scenario it will results in a value equal to 2626 €/sqm while in the second it results in a value equal to 2688 €/sqm. Technically this difference should reflect the value defined in *Table 4.1.5* that gives a difference value of almost 82 €/sqm. In our case this difference is 62 €/sqm, almost the 25% lower than expected. Anyway, the difference in the Net Present Value in the two Discounted Cash Flow, that accounts for more than € 700.000,00 represent the value of a more sustainable Energy Label, the market value is greater than 2,3%.

## 5.2 Case 2 CASSINA DE PECCHI

The property is located 15 Km north-east of Milan, in the municipality of Cassina De Pecchi. The site can be easily reached from the Milano - Bergamo state road and is located 9 km from the Milan ring road. The location under analysis is located few hundred meters away from the stop of the subway of Milano line 2. The Linate airport is just 10 km away from the area.

The property consists of two linked buildings known as “Building 1" and “Building 2” and are part of an office park of six buildings named "Cassina Plaza". The complex is completely fenced and includes various parking spaces and green areas. The building are composed by four floors each with an intended use as offices and the basement is intended as parking lots and technical service spaces. The building has a rectangular plan. The structure is supported by modular plinths in reinforced concrete and the roof is flat. The facades are entirely smooth. The floors are organized in open space with movable partition walls. The building has been completely renovated in the internal and external parts, electrical, mechanical and heating systems. All these activities were carried out between 2007 and 2009.

The area of the two building are:

- Building (1): gross area:16.521 sqm, commercial: 10.583 sqm;
- Building (2): gross area: 16.446 sqm, commercial: 10.518 sqm;
- Together with the two building there are the parking lots of approximatively 1.000 sqm each.

Both buildings are entirely vacant and so the the rent should be foreseen with a strategy that takes into account a step un rent.

Assumption:

- Step-up rent: the step rent are calculated according to this methodology: 65% for the first year, 85% for the second year and 100% from the third year on;

| **Year** | **1** | **2** | **3** | **4** | **5** | **6** |
|---|---|---|---|---|---|---|
| **Step Rent** *(%)* | 65% | 85% | 100% | 100% | 100% | 100% |
| **Rent** *(€/sqm)* | 110 | 110 | 110 | 110 | 110 | 110 |
| **Tot** *(€/sqm)* | 71,5 | 93,5 | 110 | 110 | 110 | 110 |
| **Avg** *(€/sqm)* | 100,8 | | | | | |

*Figure 5.2.1 Step-up rents over 6 years, intended as incentive to attract customers*

- Occupancy rate: the occupancy rate for the two building has been forecasted to reach a maximum amount of 50% of the spaces in the first 6 years

| **Building 1** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** |
| **GF** | 0% | 0% | 35% | 81% | 96% | 100% | 100% | 100% | 100% | 100% |
| **F1** | 0% | 35% | 81% | 96% | 100% | 100% | 100% | 100% | 100% | 100% |
| **F2** | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| **F3** | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| **Building 2** | | | | | | | | | | |
| **Year** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| **GF** | 0% | 0% | 16% | 40% | 85% | 96% | 100% | 100% | 100% | 100% |
| **F1** | 0% | 16% | 56% | 90% | 100% | 100% | 100% | 100% | 100% | 100% |
| **F2** | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| **F3** | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| TotAvg | 0% | 6% | 24% | 38% | 48% | 50% | 50% | 50% | 50% | 50% |

*Figure 5.2.2 Diagram of the occupancy rates over the floor for building 1 and 2*

- Time of the analysis 10 years;
- Istat location adjustment equal to the 75% of 1,80%, as the most common in most of the contract and as defined by the Italian Legislation;
- Interest rate equal to 7,11% composed by an additional risk premium equal to 5,5% and 1,61% equal to the return of 30 years IRS (value at 14/11/2017);
- IMU equal to 10% of the revenues;
- Insurance equal to € 10.949;
- Property Management expenses 1,00% of the revenues;
- Extraordinary maintenance 0,60% of the revenues;
- Contract registration equal to 0,50% of the revenues;

- Market rent for Case in energy performance rating G equal to: 110,0 €/sqm year (defined as the sum of the average base rent 110,0 €/sqm + premium market rent equal to 0,0 € in case of a building label as G )
- Market rent for Case in energy performance rating C equal to: 139,00 €/sqm year (defined as the sum of the average base rent 110,0 €/sqm + premium market rent equal to 29,0 € in case of a building label as C defined by yield equal to 8,25% from data defined in *Table 4.1.6*)

ENERGY LABEL G

**CASSINA DE' PECCHI (MI) VIA ROMA 108 EDFICIO (B) G CLASS**

| | | % |
|---|---|---|
| **Commercial Area** | **10.583** | |
| Non-rented Area | 10.583 | 100,00% |
| Rented Area | 0 | 0,00% |
| Passing Rent (€/sqm/year) | 0 | |
| Passing Rent (€/year) | **0** | |

| | STABILIZED RENT | AREA | MR/AREA | MR | Year: 31/12/2018 | 31/12/2019 | 31/12/2020 | 31/12/2021 | 31/12/2022 | 31/12/2023 | 31/12/2024 | 31/12/2025 | 31/12/2026 | 31/12/2027 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **Totale** |
| *Tenant* | | *(sqm)* | *(€/sqm/yr)* | *(MR €/yr)* | 0% | 0% | 35% | 81% | 96% | 100% | 100% | 100% | 100% | 100% | |
| **Piano Terra Ed. B** | 0 | 2.375 | 110 | 261.250 | 0 | 0 | 95.191 | 223.962 | 268.891 | 283.138 | 286.961 | 290.835 | 294.761 | 298.740 | **2.042.479** |
| | | | | | 0% | 35% | 81% | 96% | 100% | 100% | 100% | 100% | 100% | 100% | |
| **Piano 1 Ed. B** | 0 | 2.736 | 110 | 300.960 | 0 | 108.199 | 254.568 | 305.636 | 321.831 | 326.175 | 330.579 | 335.042 | 339.565 | 344.149 | **2.665.743** |
| | | | | | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | |
| **Piano 2 Ed. B** | 0 | 2.736 | 110 | 300.960 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| | | | | | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | |
| **Piano 3 Ed. B** | 0 | 2.736 | 110 | 300.960 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| | | | | | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | |
| **Posti auto** | 0 | 412 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| **Total Revenues** | **0** | | | | **0** | **108.199** | **349.759** | **529.598** | **590.721** | **609.314** | **617.540** | **625.876** | **634.326** | **642.889** | **4.708.222** |
| IMU | 10% | | | | 56.980 | 57.749 | 58.529 | 59.319 | 60.120 | 60.931 | 61.754 | 62.588 | 63.433 | 64.289 | 605.691 |
| Insurance | 0,70% | | | | 3.989 | 4.042 | 4.097 | 4.152 | 4.208 | 4.265 | 4.323 | 4.381 | 4.440 | 4.500 | 42.398 |
| Property Mng | 0,75% | | | | 0 | 834 | 2.731 | 4.191 | 4.738 | 4.953 | 5.087 | 5.226 | 5.368 | 5.514 | 38.640 |
| Extraordinary maintenance | 1,50% | | | | 0 | 1.667 | 5.462 | 8.382 | 9.475 | 9.905 | 10.175 | 10.451 | 10.735 | 11.027 | 77.280 |
| Contract registration | 0,50% | | | | 0 | 541 | 1.749 | 2.648 | 2.954 | 3.047 | 3.088 | 3.129 | 3.172 | 3.214 | 23.541 |
| **Total cost** | | | | | **60.969** | **64.833** | **72.567** | **78.692** | **81.495** | **83.101** | **84.427** | **85.775** | **87.148** | **88.544** | 787.551 |
| **Net Revenues** | | | | | **-60.969** | **43.366** | **277.191** | **450.906** | **509.227** | **526.213** | **533.113** | **540.101** | **547.178** | **554.345** | **3.920.672** |
| | ***Gross*** | | | | | | | | | | | | | | |
| *Terminal Value* | 7,50% | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8.571.855 | 8.571.855 |
| ***FCFO*** | | | | | **-60.969** | **43.366** | **277.191** | **450.906** | **509.227** | **526.213** | **533.113** | **540.101** | **547.178** | **9.126.200** | 12.492.527 |
| **NPV - Valore immobile** | **€ 6.786.878** | | NPV/sqm | 641 | | | | | | | | | | | |

*Figure 5.2.3 Discounted Cash Flow Model applied on a 10 years analysis for a office building in G label*

**ENERGY LABEL G**

**CASSINA DE' PECCHI (MI) VIA ROMA 108 EDFICIO (E) G CLASS**

| | | % |
|---|---|---|
| **Commercial Area** | **10.518** | |
| Non-rented Area | 10.518 | 100,00% |
| Rented Area | 0 | 0,00% |
| Passing Rent (€/sqm/year) | 0 | |
| Passing Rent (€/year) | 0 | |

| Tenant | STABILIZED RENT | AREA (sqm) | MR/AREA (€/sqm/yr) | MR (MR €/yr) | 31/12/2018 1 | 31/12/2019 2 | 31/12/2020 3 | 31/12/2021 4 | 31/12/2022 5 | 31/12/2023 6 | 31/12/2024 7 | 31/12/2025 8 | 31/12/2026 9 | 31/12/2027 10 | Totale |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | |
| **Piano Terra Ed. E** | 0 | 2.375 | 110 | 261.250 | 0 | 0 | 44.196 | 110.258 | 237.462 | 272.521 | 286.961 | 290.835 | 294.761 | 298.740 | **1.835.734** |
| | | | | | 0% | 16% | 56% | 90% | 100% | 100% | 100% | 100% | 100% | 100% | |
| **Piano 1 Ed. E** | 0 | 2.671 | 110 | 293.810 | 0 | 49.042 | 172.052 | 279.000 | 314.185 | 318.426 | 322.725 | 327.082 | 331.498 | 335.973 | **2.449.983** |
| | | | | | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | |
| **Piano 2 Ed. E** | 0 | 2.736 | 110 | 300.960 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| | | | | | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | |
| **Piano 3 Ed. E** | 0 | 2.736 | 110 | 300.960 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| | | | | | 0% | 0% | 0% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| **Posti auto** | 0 | 412 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| **Total Revenues** | **0** | | | | **0** | **49.042** | **216.248** | **389.258** | **551.647** | **590.947** | **609.686** | **617.917** | **626.259** | **634.713** | **4.285.717** |
| IMU | 10% | | | | 62.160 | 62.999 | 63.850 | 64.712 | 65.585 | 66.471 | 67.368 | 68.277 | 69.199 | 70.133 | 660.754 |
| Insurance | 0,70% | | | | 4.351 | 4.410 | 4.469 | 4.530 | 4.591 | 4.653 | 4.716 | 4.779 | 4.844 | 4.909 | 46.253 |
| Property Mng | 0,75% | | | | 0 | 378 | 1.688 | 3.080 | 4.424 | 4.803 | 5.023 | 5.159 | 5.299 | 5.443 | 35.299 |
| Extraordinary maintenance | 1,50% | | | | 0 | 756 | 3.377 | 6.161 | 8.849 | 9.607 | 10.045 | 10.318 | 10.599 | 10.887 | 70.598 |
| Contract registration | 0,50% | | | | 0 | 245 | 1.081 | 1.946 | 2.758 | 2.955 | 3.048 | 3.090 | 3.131 | 3.174 | 21.429 |
| **Total cost** | | | | | **66.511** | **68.788** | **74.466** | **80.429** | **86.207** | **88.489** | **90.200** | **91.624** | **93.073** | **94.547** | 834.332 |
| **Net Revenues** | | | | | **-66.511** | **-19.746** | **141.782** | **308.830** | **465.440** | **502.459** | **519.486** | **526.293** | **533.186** | **540.166** | **3.451.384** |
| | *Gross* | | | | | | | | | | | | | | |
| *Terminal Value* | 7,50% | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8.462.841 | 8.462.841 |
| ***FCFO*** | | | | | **-66.511** | **-19.746** | **141.782** | **308.830** | **465.440** | **502.459** | **519.486** | **526.293** | **533.186** | **9.003.008** | 11.914.225 |
| **NPV - Valore immobile** | **€ 6.375.841** | | NPV/sqm | 606 | | | | | | | | | | | |

*Figure 5.2.4 Discounted Cash Flow Model applied on a 10 years analysis for a office building in G label*

**ENERGY LABEL C**

**CASSINA DE' PECCHI (MI) VIA ROMA 108 EDFICIO (B) C CLASS**

| | | % |
|---|---|---|
| **Commercial Area** | **10.583** | |
| Non-rented Area | 10.583 | 100,00% |
| Rented Area | 0 | 0,00% |
| Passing Rent (€/sqm/year) | 0 | |
| Passing Rent (€/year) | 0 | |

| | STABILIZED | AREA | MR/AREA | MR | Year: 31/12/2018 | 31/12/2019 | 31/12/2020 | 31/12/2021 | 31/12/2022 | 31/12/2023 | 31/12/2024 | 31/12/2025 | 31/12/2026 | 31/12/2027 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Tenant* | **RENT** | *(sqm)* | *(€/sqm/yr)* | *(MR €/yr)* | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **Totale** |
| | | | | | 0% | 0% | 35% | 81% | 96% | 100% | 100% | 100% | 100% | 100% | |
| **Piano Terra Ed. B** | 0 | 2.375 | 139 | 330.125 | 0 | 0 | 120.287 | 283.007 | 339.780 | 357.784 | 362.614 | 367.509 | 372.471 | 377.499 | **2.580.951** |
| | | | | | 0% | 35% | 81% | 96% | 100% | 100% | 100% | 100% | 100% | 100% | |
| **Piano 1 Ed. B** | 0 | 2.736 | 139 | 380.304 | 0 | 136.725 | 321.681 | 386.213 | 406.677 | 412.167 | 417.731 | 423.371 | 429.086 | 434.879 | **3.368.530** |
| | | | | | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | |
| **Piano 2 Ed. B** | 0 | 2.736 | 139 | 380.304 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| | | | | | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | |
| **Piano 3 Ed. B** | 0 | 2.736 | 139 | 380.304 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| | | | | | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | |
| **Posti auto** | 0 | 412 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| | Canone a corpo | | | | | | | | | | | | | | |
| **Total Revenues** | **0** | | | | **0** | **136.725** | **441.968** | **669.220** | **746.457** | **769.951** | **780.346** | **790.880** | **801.557** | **812.378** | **5.949.481** |
| IMU | 10% | | | | 56.980 | 57.749 | 58.529 | 59.319 | 60.120 | 60.931 | 61.754 | 62.588 | 63.433 | 64.289 | 605.691 |
| Insurance | 0,70% | | | | 3.935 | 3.935 | 3.935 | 3.935 | 3.935 | 3.935 | 3.935 | 3.935 | 3.935 | 3.935 | 39.355 |
| Property Mng | 0,75% | | | | 0 | 1.053 | 3.451 | 5.296 | 5.987 | 6.258 | 6.429 | 6.603 | 6.783 | 6.967 | 48.827 |
| Extraordinary maintenance | 1,50% | | | | 0 | 2.107 | 6.902 | 10.591 | 11.973 | 12.517 | 12.857 | 13.207 | 13.566 | 13.934 | 97.654 |
| Contract registration | 0,50% | | | | 0 | 684 | 2.210 | 3.346 | 3.732 | 3.850 | 3.902 | 3.954 | 4.008 | 4.062 | 29.747 |
| **Total cost** | | | | | **60.915** | **65.528** | **75.027** | **82.488** | **85.748** | **87.492** | **88.877** | **90.287** | **91.724** | **93.188** | 821.274 |
| **Net Revenues** | | | | | **-60.915** | **71.196** | **366.941** | **586.732** | **660.710** | **682.459** | **691.469** | **700.593** | **709.833** | **719.190** | **5.128.207** |
| | ***Gross*** | | | | | | | | | | | | | | |
| *Terminal Value* | 7,50% | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10.831.708 | 10.831.708 |
| ***FCFO*** | | | | | **-60.915** | **-236.958** | **366.941** | **586.732** | **660.710** | **682.459** | **691.469** | **700.593** | **709.833** | **11.036.322** | 14.267.978 |
| **NPV - Valore immobile** | **€ 7.760.724** | | NPV /sqm | 733 | | | | | | | | | | | |

*Figure 5.2.5 Discounted Cash Flow Model applied on a 10 years analysis for a office building in C label*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ENERGY LABEL C** | | | | | | | | | | | | | | | |
| **CASSINA DE' PECCHI (MI) VIA ROMA 108 EDFICIO (E) C CLASS** | | | | | | | | | | | | | | | |
| **Commercial Area** | **10.518** | % | | | | | | | | | | | | | |
| Non-rented Area | 10.518 | 100,00% | | | | | | | | | | | | | |
| Rented Area | 0 | 0,00% | | | | | | | | | | | | | |
| Passing Rent (€/sqm/year) | 0 | | | | | | | | | | | | | | |
| Passing Rent (€/year) | **0** | | | | | | | | | | | | | | |
| | | | | | *Year:* | | | | | | | | | | |
| | | | | | 31/12/2018 | 31/12/2019 | 31/12/2020 | 31/12/2021 | 31/12/2022 | 31/12/2023 | 31/12/2024 | 31/12/2025 | 31/12/2026 | 31/12/2027 | |
| | | | | | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **Totale** |
| | **STABILIZED** | **AREA** | **MR/AREA** | **MR** | | | | | | | | | | | |
| *Tenant* | **RENT** | *(sqm)* | *(€/sqm/yr)* | *(MR €/yr)* | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | |
| **Piano Terra Ed. E** | 0 | 2.375 | 139 | 330.125 | 0 | 0 | 55.847 | 139.326 | 300.066 | 344.367 | 362.614 | 367.509 | 372.471 | 377.499 | **2.319.700** |
| | | | | | 0% | 16% | 56% | 90% | 100% | 100% | 100% | 100% | 100% | 100% | |
| **Piano 1 Ed. E** | 0 | 2.671 | 139 | 371.269 | 0 | 61.971 | 217.411 | 352.554 | 397.015 | 402.375 | 407.807 | 413.313 | 418.892 | 424.547 | **3.095.888** |
| | | | | | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | |
| **Piano 2 Ed. E** | 0 | 2.736 | 139 | 380.304 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| | | | | | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | |
| **Piano 3 Ed. E** | 0 | 2.736 | 139 | 380.304 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| | | | | | 0% | 0% | 0% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| **Posti auto** | 0 | 412 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| | Canone a corpo | | | | | | | | | | | | | | |
| **Total Revenues** | **0** | | | | **0** | **61.971** | **273.259** | **491.881** | **697.081** | **746.742** | **770.421** | **780.822** | **791.363** | **802.047** | **5.415.587** |
| IMU | 10% | | | | 62.160 | 62.999 | 63.850 | 64.712 | 65.585 | 66.471 | 67.368 | 68.277 | 69.199 | 70.133 | 660.754 |
| Insurance | 0,70% | | | | 4.351 | 4.410 | 4.469 | 4.530 | 4.591 | 4.653 | 4.716 | 4.779 | 4.844 | 4.909 | 46.253 |
| Property Mng | 0,75% | | | | 0 | 477 | 2.134 | 3.892 | 5.591 | 6.070 | 6.347 | 6.519 | 6.697 | 6.879 | 44.605 |
| Extraordinary maintenance | 1,50% | | | | 0 | 955 | 4.267 | 7.785 | 11.181 | 12.140 | 12.694 | 13.039 | 13.393 | 13.757 | 89.210 |
| Contract registration | 0,50% | | | | 0 | 310 | 1.366 | 2.459 | 3.485 | 3.734 | 3.852 | 3.904 | 3.957 | 4.010 | 27.078 |
| **Total cost** | | | | | **66.511** | **69.151** | **76.086** | **83.378** | **90.434** | **93.067** | **94.976** | **96.519** | **98.090** | **99.689** | 867.900 |
| **Net Revenues** | | | | | **-66.511** | **-7.180** | **197.173** | **408.503** | **606.647** | **653.676** | **675.445** | **684.303** | **693.274** | **702.358** | **4.547.687** |
| | ***Gross*** | | | | | | | | | | | | | | |
| *Terminal Value* | 7,50% | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10.693.954 | 10.693.954 |
| ***FCFO*** | | | | | **-66.511** | **-315.335** | **197.173** | **408.503** | **606.647** | **653.676** | **675.445** | **684.303** | **693.274** | **10.881.735** | 13.549.704 |
| **NPV** | **€ 7.250.191** | NPV/sqm | | 689 | | | | | | | | | | | |

*Figure 5.2.6 Discounted Cash Flow Model applied on a 10 years analysis for a office building in label*

As is possible to see from *Table 5.2.3* and *5.2.4*, the two building labelled as G, had an overall NPV equal to € 13.100.000,00, while the two in energy performance label equal to C had an overall NPV equal to € 15.000.000,00. According to the specific risk of this investment specifically related to the location and the vacancy rate the Internal Rate of Return would be much higher than the previous case, probably even higher than one required by a core investor. Anyway, by just considering the NPV of the future cash flows divided by the overall area, the obtain values are not in line with the *Table 4.1.5*, because as defined by the table the difference should be almost 300 €/sqm while by the results obtained in the DCF the overall difference is less than 100 €/sqm. Anyway, the difference in this case is much greater than in case 1, in fact the difference in the Net Present Value is nearly the 12,7%, with a difference in monetary terms equal to € 1.900.000,00 that accounts only for the greater energy performances of the Buildings.

# 5.3 CASE 3 RETAIL DOMODOSSOLA

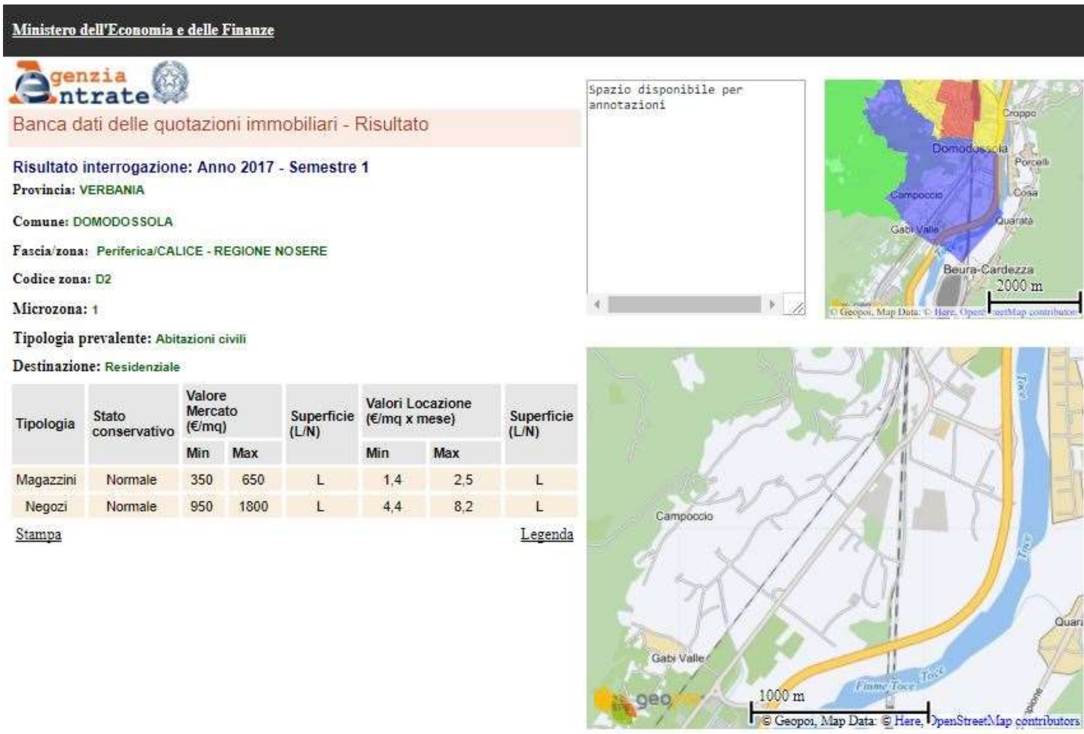
The property under analysis, is located in the southern part of the municipality of Domodossola, belonging to the province of Verbano-Cusio-Ossola, close to the historic Sempione road. The area in which the commercial centre is located is characterized by a commercial vocation, with a presence of warehouses due to the strategic location. In fact is located near the route of Sempione SS33, an important streets which connects different areas of the valley and close to the exit "DomodossoIa" of S.S.33 (E62).

The building under analysis is a commercial building built in the begin of the 2000, which rise of a single floor, composed by a gross Area equal to 14.752 sqm, the commercial area 6.821 square meters divided in 24 points of sale. The biggest one is let by a single tenants which use the space as hypermarket, and which is also considered the attractor for the other tenants. In fact thanks to a long term leasing contract the Stabilized rent/sqm is lower than the one paid by the other tenants. The property is actually let to 16 tenants plus 1.000 sqm actually vacant.

The first scenario represents the building as it is in energy performance rating E while the second define the building as in class B. The two models have been defined according to those premises:

- Time of the analysis 10 years;
- Istat rent adjustment equal to the 75% of 1,80%, as the most common in most of the contract;
- Interest rate equal to 7,11% composed by an additional risk premium equal to 6,5% and 1,61% equal to the return of 30 years IRS (value at 14/11/2017);
- IMU equal to € 54.198;
- Insurance equal to € 4.185;
- Property Management expenses equal to € 9.000;
- Extraordinary maintenance equal to € 42.000;
- Contract registration equal to 0,50% of the revenues;

- Uncollectable rent equal to 4% of the location revenues;
- Average Base Rent has been calculated equal to the one originally payed by the tenants, which is in line with data provided from the "Osservatorio del Mercato Immobiliare", to these base rents has been added, as previously done in the other chapter the Premium Rent:
- In the scenario labelled as E the premium rent has been considered 15,90 €/sqm as calculated in *Chapter 4* in *Table 4.2.6* by considering a yield equal to 7,00%;
- In the scenario labelled as B the premium rent has been considered 31,70 €/sqm as calculated in *Chapter 4* in *Table 4.2.6* by considering a yield equal to 7,00%;


Ministero dell'Economia e delle Finanze

Agenzia Entrate

Banca dati delle quotazioni immobiliari - Risultato

Risultato interrogazione: Anno 2017 - Semestre 1

Provincia: VERBANIA

Comune: DOMODOSSOLA

Fascia/zona: Periferica/CALICE - REGIONE NOSERE

Codice zona: D2

Microzona: 1

Tipologia prevalente: Abitazioni civili

Destinazione: Residenziale

| Tipologia | Stato conservativo | Valore Mercato (€/mq) | | Superficie (L/N) | Valori Locazione (€/mq x mese) | | Superficie (L/N) |
|---|---|---|---|---|---|---|---|
| | | Min | Max | | Min | Max | |
| Magazzini | Normale | 350 | 650 | L | 1,4 | 2,5 | L |
| Negozi | Normale | 950 | 1800 | L | 4,4 | 8,2 | L |

Stampa Legenda



*Figure 5.3.1 OMI-Domodossola D2*

**Building energy label E**

**Domodossola Retail Park**

| | | Percentuale |
|---|---|---|
| **Commercial Area** | **6.821** | |
| Non-rented Area | 977 | 14,32% |
| Rented Area | 5.844 | 85,68% |
| *MR €/anno* | 591.269 | |
| *MR €/mq anno* | 101 | |

| *Tenant* | | STABILIZED RENT | AREA *(sqm)* | PR/AREA *(€/mq/anno)* | MR/AREA *(€/sqm/yr)* | MR *(MR €/yr)* | 1 (31/12/2018) | 2 (31/12/2019) | 3 (31/12/2020) | 4 (31/12/2021) | 5 (31/12/2022) | 6 (31/12/2023) | 7 (31/12/2024) | 8 (31/12/2025) | 9 (31/12/2026) | 10 (31/12/2027) | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | 1 | 340.000 | 4.338 | 78 0,8 | 97 | 420.352 | 344.590 | 349.242 | 353.957 | 358.735 | 363.578 | 368.486 | 373.461 | 378.503 | 383.612 | 388.791 | **3.662.956** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | 2 | 15.612 | 60 | 261 | 190 | 11.375 | 15.823 | 16.036 | 11.842 | 12.002 | 12.164 | 12.328 | 12.494 | 12.663 | 12.834 | 13.007 | **131.194** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | 3 | 11.920 | 67 | 177 | 190 | 12.761 | 12.081 | 12.244 | 12.409 | 12.577 | 13.646 | 13.830 | 14.017 | 14.206 | 14.398 | 14.593 | **134.002** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | 4 | 18.054 | 96 | 188 | 190 | 18.192 | 18.298 | 18.545 | 18.795 | 19.049 | 19.306 | 19.567 | 19.831 | 20.098 | 20.370 | 20.803 | **194.661** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | 5 | 9.006 | 96 | 93 | 190 | 18.306 | 9.128 | 9.251 | 9.376 | 9.502 | 9.631 | 9.761 | 9.892 | 10.026 | 10.161 | 10.298 | **97.025** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | 6 | 33.316 | 113 | 295 | 190 | 21.440 | 33.766 | 22.022 | 22.320 | 22.621 | 22.926 | 23.236 | 23.550 | 23.868 | 24.190 | 24.516 | **243.015** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | 7 | 7.908 | 79 | 100 | 190 | 15.002 | 15.205 | 15.410 | 15.618 | 15.829 | 16.042 | 16.259 | 16.479 | 16.701 | 16.926 | 17.155 | **161.624** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | 8 | 8.440 | 77 | 110 | 190 | 14.622 | 8.554 | 8.669 | 8.786 | 8.905 | 9.025 | 9.147 | 16.061 | 16.278 | 16.498 | 16.721 | **118.645** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | 9 | 60.000 | 515 | 117 | 144 | 74.109 | 60.810 | 61.631 | 62.463 | 63.306 | 64.161 | 65.027 | 65.905 | 82.501 | 83.615 | 84.743 | **694.161** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | 10 | 8.090 | 64 | 126 | 190 | 12.154 | 8.199 | 8.310 | 8.422 | 8.536 | 8.651 | 8.768 | 8.886 | 9.006 | 9.128 | 13.898 | **91.804** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | 11 | 47.017 | 175 | 269 | 190 | 33.233 | 47.652 | 48.295 | 48.947 | 49.608 | 50.278 | 50.956 | 51.644 | 36.996 | 37.495 | 38.001 | **459.872** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | 12 | 10.127 | 51 | 199 | 190 | 9.647 | 10.264 | 10.402 | 10.543 | 10.178 | 10.316 | 10.455 | 10.596 | 10.739 | 10.884 | 11.031 | **105.410** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | 13 | 3.925 | 25 | 160 | 190 | 4.653 | 3.978 | 4.032 | 4.086 | 4.141 | 4.197 | 4.254 | 4.311 | 4.369 | 4.428 | 5.320 | **43.118** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | 14 | 13.324 | 75 | 178 | 190 | 14.243 | 13.504 | 13.686 | 13.871 | 14.058 | 14.248 | 14.440 | 14.635 | 15.855 | 16.069 | 16.286 | **146.654** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | 15 | 3.226 | 1 | 2.933 | 3.000 | 3.300 | 3.270 | 3.390 | 3.435 | 3.482 | 3.529 | 3.576 | 3.625 | 3.674 | 3.723 | 3.774 | **35.477** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | 16 | 3.900 | 13 | 312 | 190 | 2.374 | 2.406 | 2.438 | 2.471 | 2.505 | 2.538 | 2.573 | 2.607 | 2.643 | 2.678 | 2.714 | **25.573** |
| | | | | | | | 20% | 40% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | |
| **Vacant** | | 0 | 977 | 0 | 144 | 140.590 | 28.498 | 57.765 | 73.181 | 74.169 | 75.170 | 76.185 | 77.213 | 78.256 | 79.312 | 80.383 | **700.130** |
| **Total Revenues** | | **593.865** | | | | | **636.023** | **661.368** | **680.522** | **689.203** | **699.406** | **708.848** | **725.209** | **736.382** | **746.323** | **762.036** | **7.045.321** |
| IMU | | 54.198 | | | | | 54.930 | 55.671 | 56.423 | 57.184 | 57.956 | 58.739 | 59.532 | 60.336 | 61.150 | 61.976 | 583.897 |
| Insurance | | 4.185 | | | | | 4.241 | 4.299 | 4.357 | 4.416 | 4.475 | 4.536 | 4.597 | 4.659 | 4.722 | 4.786 | 45.087 |
| Property Mng | | 9.000 | | | | | 9.000 | 9.000 | 9.000 | 9.000 | 9.000 | 9.000 | 9.000 | 9.000 | 9.000 | 9.000 | 90.000 |
| Extraordinary maintenance | | 42.000 | | | | | 42.000 | 42.000 | 42.000 | 42.000 | 42.000 | 42.000 | 42.000 | 42.000 | 42.000 | 42.000 | 420.000 |
| Contract registration | | 0,50% | | | | | 3.180 | 3.307 | 3.403 | 3.446 | 3.497 | 3.544 | 3.626 | 3.682 | 3.732 | 3.810 | 35.227 |
| Uncollectable lease | | 4,00% | | | | | 25.441 | 26.455 | 27.221 | 27.568 | 27.976 | 28.354 | 29.008 | 29.455 | 29.853 | 30.481 | 281.813 |
| **Total cost** | | | | | | | **138.792** | **140.732** | **142.403** | **143.614** | **144.905** | **146.173** | **147.763** | **149.132** | **150.456** | **152.053** | 1.456.023 |
| **Net Revenues** | | | | | | | **497.231** | **520.637** | **538.119** | **545.588** | **554.502** | **562.676** | **577.446** | **587.251** | **595.867** | **609.983** | **5.589.298** |
| | | ***Gross*** | | | | | | | | | | | | | | | |
| *Terminal Value* | | 7,00% | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10.886.224 | 10.886.224 |
| ***FCFO*** | | | | | | | **497.231** | **520.637** | **538.119** | **545.588** | **554.502** | **562.676** | **577.446** | **587.251** | **595.867** | **11.496.207** | 16.475.522 |
| **NPV** | | **€ 9.337.915** | NPV/sqm | | 1369 | | | | | | | | | | | | |

*Figure 5.3.2 Discounted Cash Flow Model applied on a 10 years analysis for retail building in E label*

**Building energy label E**

Domodossola Retail Park

| | | Percentuale |
|---|---|---|
| **Commercial Area** | **6.821** | |
| Non-rented Area | 977 | 14,32% |
| Rented Area | 5.844 | 85,68% |
| *MR €/anno* | 591.269 | |
| *MR €/mq anno* | 101 | |

| *Tenant* | | **STABILIZED RENT** | **AREA** *(sqm)* | **PR/AREA** *(€/mq/anno)* | **MR/AREA** *(€/sqm/yr)* | **MR** *(MR €/yr)* | *Year:* 31/12/2018 **1** | 31/12/2019 **2** | 31/12/2020 **3** | 31/12/2021 **4** | 31/12/2022 **5** | 31/12/2023 **6** | 31/12/2024 **7** | 31/12/2025 **8** | 31/12/2026 **9** | 31/12/2027 **10** | **Totale** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | **1** | 340.000 | 4.338 | 78 0,69 | 113 | 488.893 | 344.590 | 349.242 | 353.957 | 358.735 | 363.578 | 368.486 | 373.461 | 378.503 | 383.612 | 388.791 | **3.662.956** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | **2** | 15.612 | 60 | 261 | 206 | 12.321 | 15.823 | 16.036 | 12.827 | 13.000 | 13.176 | 13.354 | 13.534 | 13.717 | 13.902 | 14.090 | **139.459** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | **3** | 11.920 | 67 | 177 | 206 | 13.823 | 12.081 | 12.244 | 12.409 | 12.577 | 14.782 | 14.981 | 15.183 | 15.388 | 15.596 | 15.807 | **141.049** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | **4** | 18.054 | 96 | 188 | 206 | 19.706 | 18.298 | 18.545 | 18.795 | 19.049 | 19.306 | 19.567 | 19.831 | 20.098 | 20.370 | 22.534 | **196.392** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | **5** | 9.006 | 96 | 93 | 206 | 19.829 | 9.128 | 9.251 | 9.376 | 9.502 | 9.631 | 9.761 | 9.892 | 10.026 | 10.161 | 10.298 | **97.025** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | **6** | 33.316 | 113 | 295 | 206 | 23.224 | 33.766 | 23.855 | 24.177 | 24.503 | 24.834 | 25.169 | 25.509 | 25.853 | 26.202 | 26.556 | **260.425** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | **7** | 7.908 | 79 | 100 | 206 | 16.250 | 16.470 | 16.692 | 16.917 | 17.146 | 17.377 | 17.612 | 17.850 | 18.091 | 18.335 | 18.582 | **175.071** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | **8** | 8.440 | 77 | 110 | 206 | 15.839 | 8.554 | 8.669 | 8.786 | 8.905 | 9.025 | 9.147 | 17.398 | 17.633 | 17.871 | 18.112 | **124.100** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | **9** | 60.000 | 515 | 117 | 160 | 82.246 | 60.810 | 61.631 | 62.463 | 63.306 | 64.161 | 65.027 | 65.905 | 91.559 | 92.795 | 94.048 | **721.705** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | **10** | 8.090 | 64 | 126 | 206 | 13.165 | 8.199 | 8.310 | 8.422 | 8.536 | 8.651 | 8.768 | 8.886 | 9.006 | 9.128 | 15.054 | **92.960** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | **11** | 47.017 | 175 | 269 | 206 | 35.998 | 47.652 | 48.295 | 48.947 | 49.608 | 50.278 | 50.956 | 51.644 | 40.074 | 40.615 | 41.163 | **469.232** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | **12** | 10.127 | 51 | 199 | 206 | 10.450 | 10.264 | 10.402 | 10.543 | 11.025 | 11.174 | 11.325 | 11.478 | 11.633 | 11.790 | 11.949 | **111.583** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | **13** | 3.925 | 25 | 160 | 206 | 5.040 | 3.978 | 4.032 | 4.086 | 4.141 | 4.197 | 4.254 | 4.311 | 4.369 | 4.428 | 5.763 | **43.560** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | **14** | 13.324 | 75 | 178 | 206 | 15.428 | 13.504 | 13.686 | 13.871 | 14.058 | 14.248 | 14.440 | 14.635 | 17.175 | 17.406 | 17.641 | **150.665** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | **15** | 3.226 | 1 | 2.933 | 3.000 | 3.300 | 3.270 | 3.390 | 3.435 | 3.482 | 3.529 | 3.576 | 3.625 | 3.674 | 3.723 | 3.774 | **35.477** |
| | | | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | **16** | 3.900 | 13 | 312 | 206 | 2.571 | 2.606 | 2.641 | 2.677 | 2.713 | 2.750 | 2.787 | 2.824 | 2.862 | 2.901 | 2.940 | **27.701** |
| | | | | | | | 20% | 40% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | |
| **Vacant** | | 0 | 977 | 0 | 160 | 156.027 | 31.627 | 64.107 | 81.216 | 82.312 | 83.423 | 84.550 | 85.691 | 86.848 | 88.020 | 89.209 | **777.003** |
| **Total Revenues** | | **593.865** | | | | | **640.617** | **671.028** | **692.905** | **702.599** | **714.119** | **723.760** | **741.658** | **766.509** | **776.857** | **796.311** | **7.226.363** |
| IMU | | 54.198 | | | | | 54.930 | 55.671 | 56.423 | 57.184 | 57.956 | 58.739 | 59.532 | 60.336 | 61.150 | 61.976 | 583.897 |
| Insurance | | 4.185 | | | | | 4.241 | 4.299 | 4.357 | 4.416 | 4.475 | 4.536 | 4.597 | 4.659 | 4.722 | 4.786 | 45.087 |
| Property Mng | | 9.000 | | | | | 9.000 | 9.000 | 9.000 | 9.000 | 9.000 | 9.000 | 9.000 | 9.000 | 9.000 | 9.000 | 90.000 |
| Extraordinary maintenance | | 42.000 | | | | | 42.000 | 42.000 | 42.000 | 42.000 | 42.000 | 42.000 | 42.000 | 42.000 | 42.000 | 42.000 | 420.000 |
| Contract registration | | 0,50% | | | | | 3.203 | 3.355 | 3.465 | 3.513 | 3.571 | 3.619 | 3.708 | 3.833 | 3.884 | 3.982 | 36.132 |
| Uncollectable lease | | 4,00% | | | | | 25.625 | 26.841 | 27.716 | 28.104 | 28.565 | 28.950 | 29.666 | 30.660 | 31.074 | 31.852 | 289.055 |
| **Total cost** | | | | | | | **138.999** | **141.166** | **142.960** | **144.217** | **145.567** | **146.844** | **148.503** | **150.487** | **151.830** | **153.595** | 1.464.170 |
| **Net Revenues** | | | | | | | **501.618** | **529.862** | **549.944** | **558.382** | **568.552** | **576.916** | **593.154** | **616.022** | **625.026** | **642.716** | **5.762.193** |
| | | ***Gross*** | | | | | | | | | | | | | | | |
| *Terminal Value* | | 6,50% | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12.250.943 | 12.250.943 |
| ***FCFO*** | | | | | | | **501.618** | **529.862** | **549.944** | **558.382** | **568.552** | **576.916** | **593.154** | **616.022** | **625.026** | **12.893.659** | 18.013.136 |
| **NPV** | | **€ 10.133.960** | | NPV/sqm | 1486 | | | | | | | | | | | | |

*Figure 5.3.3 Discounted Cash Flow Model applied on a 10 years analysis for retail building in B label*

As is possible to see from *Table 5.3.2* the building in an energy performance rating equal to E, had an overall Net Present Value equal to € 9.300.000,00, while the one in energy performance label equal to C had an overall Net Present Value that is equal to € 10.100.000,00. If we consider the Net Present Value, divided by the overall area, the obtained values are not in line with the *Table 4.2.5*, because as is possible to see in the table the difference should be almost equal to 225 €/sqm while by the results obtained in the DCF the overall difference is nearly 117 €/sqm, a bit more than the 50%. Anyway, the result obtained in the Discounted Cash Flow analysis shows that the energy performance rating gives a premium value equal to € 800.000,00 to the building in a more performing energy label.

## 5.4 CASE 4 COLLEGNO

The property is in Collegno, a town close to Turin, near the junction of the ring road that connects it directly to the capital city of Piedmont. The area is well served by public transports as there are several bus stops and, a few kilometers away, the underground station of Turin.

The building is composed by 6 floors plus a basement and crawl spaces in which are located technical spaces. The property consists of 36 apartments, 30 boxes, 42 cellars and some outdoor parking spaces in the courtyard.

The first scenario represents the building as it is in energy performance rating G while the second define the building as in class C.  The two models have been defined according to those premises:

- Time of the analysis 10 years;
- Istat location adjustment equal to the 75% of 1,80%, as the most common in most of the contract;
- Interest rate equal to 7,11% composed by an additional risk premium equal to 6,5% and 1,61% equal to the return of 30 years IRS (value at 14/11/2017);
- IMU equal to € 10% of income;
- Insurance equal to € 0,70% of income;
- Property Management expenses equal to 0,75% of income;
- Extraordinary maintenance savings equal to 1,50% of income;
- Contract registration equal to 0,50% of the revenues;
- Uncollectable rent equal to 8% of the location incomes;
- The average base rent has been considered equal to 67,20 €/sqm;
- Premium rent has been considered different in the two cases:
    - For the building considered in class G the premium rent has been considered equal to 0,00 €/sqm as defined by *Figure 4.3.6* in *Chapter 4*;
    - For the building labelled as C the premium rent has been considered equal to 13,20 €/sqm as defined by *Figure 4.3.6* in *Chapter 4;*

Ministero dell'Economia e delle Finanze

Agenzia Entrate

Banca dati delle quotazioni immobiliari - Risultato

**Risultato interrogazione: Anno 2017 - Semestre 1**

**Provincia:** TORINO

**Comune:** COLLEGNO

**Fascia/zona:** Periferica/INDUSTRIALE TANGENZIALE NORD

**Codice zona:** D2

**Microzona:** 4

**Tipologia prevalente:** Capannoni industriali

**Destinazione:** Produttiva

| Tipologia | Stato conservativo | Valore Mercato (€/mq) | | Superficie (L/N) | Valori Locazione (€/mq x mese) | | Superficie (L/N) |
|---|---|---|---|---|---|---|---|
| | | Min | Max | | Min | Max | |
| Abitazioni civili | Normale | 1050 | 1450 | L | 4,6 | 6,6 | L |

Stampa Legenda

Spazio disponibile per annotazioni



*Figure 5.4.1 OMI-Collegno, zone D2*

**Energy Label G**

**Collegno Class G**

| | | |
|---|---|---|
| **Commercial Area** | **3.900** | Percentuale |
| Non-rented Area | 0 | 25,00% |
| Rented Area | 2.925 | 75,00% |
| *MR €/anno* | 196.560 | |
| *MR €/mq anno* | 67 | |

| | | | | | *Year:* 31/12/2018 | 31/12/2019 | 31/12/2020 | 31/12/2021 | 31/12/2022 | 31/12/2023 | 31/12/2024 | 31/12/2025 | 31/12/2026 | 31/12/2027 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **STABILIZED** | **AREA** | **MR/AREA** | **MR** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **Total** |
| *Tenant* | **RENT** | *(sqm)* | *(€/sqm/yr)* | *(MR €/yr)* | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| - | 65.520 | 975 | 0 | 0 | 66.405 | 67.301 | 68.210 | 69.130 | 70.064 | 71.009 | 71.968 | 72.940 | 73.924 | 74.922 | **705.873** |
| | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| - | 65.520 | 975 | 0 | 0 | 66.405 | 67.301 | 68.210 | 69.130 | 70.064 | 71.009 | 71.968 | 72.940 | 73.924 | 74.922 | **705.873** |
| | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| - | 65.520 | 975 | 0 | 0 | 66.405 | 67.301 | 68.210 | 69.130 | 70.064 | 71.009 | 71.968 | 72.940 | 73.924 | 74.922 | **705.873** |
| **Total Revenues** | **196.560** | | | | **199.214** | **201.903** | **204.629** | **207.391** | **210.191** | **213.028** | **215.904** | **218.819** | **221.773** | **224.767** | **2.117.619** |
| IMU | 10% | | | | 20.190 | 20.739 | 21.303 | 21.882 | 22.477 | 23.088 | 23.715 | 24.360 | 25.022 | 25.702 | 228.478 |
| Insurance | 0,70% | | | | 1.413 | 1.452 | 1.491 | 1.532 | 1.573 | 1.616 | 1.660 | 1.705 | 1.752 | 1.799 | 15.993 |
| Property Mng | 0,75% | | | | 1.494 | 1.514 | 1.535 | 1.555 | 1.576 | 1.598 | 1.619 | 1.641 | 1.663 | 1.686 | 15.882 |
| Extraordinary maintenance | 1,50% | | | | 2.988 | 3.029 | 3.069 | 3.111 | 3.153 | 3.195 | 3.239 | 3.282 | 3.327 | 3.372 | 31.764 |
| Contract registration | 0,50% | | | | 996 | 1.010 | 1.023 | 1.037 | 1.051 | 1.065 | 1.080 | 1.094 | 1.109 | 1.124 | 10.588 |
| Uncollectable rent | 8,00% | | | | 15.937 | 16.152 | 16.370 | 16.591 | 16.815 | 17.042 | 17.272 | 17.506 | 17.742 | 17.981 | |
| **Total cost** | | | | | **43.019** | **43.895** | **44.792** | **45.708** | **46.646** | **47.604** | **48.585** | **49.588** | **50.614** | **51.664** | 472.115 |
| **Net Revenues** | | | | | **156.194** | **158.008** | **159.837** | **161.683** | **163.545** | **165.424** | **167.319** | **169.231** | **171.159** | **173.103** | **1.645.504** |
| | ***Gross*** | | | | | | | | | | | | | | |
| *Terminal Value* | 8,50% | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2.644.318 | 2.644.318 |
| ***FCFO*** | | | | | **156.194** | **158.008** | **159.837** | **161.683** | **163.545** | **165.424** | **167.319** | **169.231** | **171.159** | **2.817.422** | 4.289.822 |
| **NPV - Valore immobile** | **€ 2.648.831** | | NPV/sqm | 906 | | | | | | | | | | | |

*Figure 5.4.2 Discounted Cash Flow Model applied on a 10 years analysis for residential building in G label*

**Energy Label C**

**Collegno Class C**

| | | |
|---|---|---|
| **Commercial Area** | **3.900** | Percentuale |
| Non-rented Area | 0 | 25,00% |
| Rented Area | 2.925 | 75,00% |
| *MR €/anno* | 196.560 | |
| *MR €/mq anno* | 67 | |

| | STABILIZED | AREA | MR/AREA | MR | Year: 31/12/2018 | 31/12/2019 | 31/12/2020 | 31/12/2021 | 31/12/2022 | 31/12/2023 | 31/12/2024 | 31/12/2025 | 31/12/2026 | 31/12/2027 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Total |
| *Tenant* | RENT | *(sqm)* | *(€/sqm/yr)* | *(MR €/yr)* | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| - | 65.520 | 975 | 80,4 | 78.390 | 66.405 | 67.301 | 68.210 | 69.130 | 70.064 | 84.958 | 86.105 | 87.267 | 88.445 | 89.639 | **777.523** |
| | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| - | 65.520 | 975 | 80,4 | 78.390 | 66.405 | 67.301 | 68.210 | 69.130 | 70.064 | 71.009 | 71.968 | 87.267 | 88.445 | 89.639 | **749.438** |
| | | | | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| - | 65.520 | 975 | 80,4 | 78.390 | 66.405 | 67.301 | 68.210 | 69.130 | 70.064 | 71.009 | 71.968 | 72.940 | 88.445 | 89.639 | **735.111** |
| **Total Revenues** | **196.560** | | | | **199.214** | **201.903** | **204.629** | **207.391** | **210.191** | **226.977** | **230.041** | **247.474** | **265.336** | **268.918** | **2.262.072** |
| IMU | 10% | | | | 20.190 | 20.739 | 21.303 | 21.882 | 22.477 | 24.599 | 25.268 | 27.550 | 29.937 | 30.751 | 244.696 |
| Insurance | 0,70% | | | | 1.413 | 1.452 | 1.491 | 1.532 | 1.573 | 1.722 | 1.769 | 1.928 | 2.096 | 2.153 | 17.129 |
| Property Mng | 0,75% | | | | 1.494 | 1.514 | 1.535 | 1.555 | 1.576 | 1.702 | 1.725 | 1.856 | 1.990 | 2.017 | 16.966 |
| Extraordinary maintenance | 1,50% | | | | 2.988 | 3.029 | 3.069 | 3.111 | 3.153 | 3.405 | 3.451 | 3.712 | 3.980 | 4.034 | 33.931 |
| Contract registration | 0,50% | | | | 996 | 1.010 | 1.023 | 1.037 | 1.051 | 1.135 | 1.150 | 1.237 | 1.327 | 1.345 | 11.310 |
| Uncollectable rent | 8,00% | | | | 15.937 | 16.152 | 16.370 | 16.591 | 16.815 | 18.158 | 18.403 | 19.798 | 21.227 | 21.513 | |
| **Total cost** | | | | | **43.019** | **43.895** | **44.792** | **45.708** | **46.646** | **50.721** | **51.766** | **56.082** | **60.556** | **61.812** | 504.998 |
| **Net Revenues** | | | | | **156.194** | **158.008** | **159.837** | **161.683** | **163.545** | **176.255** | **178.275** | **191.392** | **204.779** | **207.106** | **1.757.075** |
| | *Gross* | | | | | | | | | | | | | | |
| *Terminal Value* | 8,50% | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3.163.738 | 3.163.738 |
| **NPV - Valore immobile** | **€ 2.891.256** | | NPV/sqm | 988 | | | | | | | | | | | |

*Figure 5.4.3 Discounted Cash Flow Model applied on a 10 years analysis for residential building in C label*

As is possible to see from *Table 5.4.2* the building in a energy performance rating G, had a overall NPV equal to € 2.640.000,00, while the one in energy performance label equal to C had a overall NPV equal to € 2.890.000,00. If we consider the NPV divided by the overall area, the obtained values are not in line with the *Table 4.3.5*, because as defined by the table the difference should be almost 163 €/sqm while by the results obtained in the DCF the overall difference is nearly 85 €/sqm. The difference in absolute terms in the Net present Value in this case, among the two scenarios is equal to € 250.000,00, almost equal to the 8,7%.

To conclude we can say that the results we obtained in this chapter are not in line with the premium value expected in *Chapter 4*, because the Discounted Cash Flow methodology tend to reduce the value of the property through its application, in fact it considers more factors than other simpler methodologies. But in any case, the results obtained in the previous paragraphs show the premium value that a more performing building can obtain. Analysing the outcome of the Second Case in particular, we can see that in a market that is very similar to an investment in a secondary market the premium attributable just to the energy performance of the Building can considerably boost the value of the building.

# Chapter 6
# CONCLUSIONS

The aim of this chapter is to analyse the results obtained during the work, evaluate the limit of the model, the limits of the analysis and understand how this work could be improved with further analysis.

The work started with an analysis of the Real Estate Market in Italy and in particular is important to emphasize that investments had started to increase in a significant way in the last three years, but still those investments are too much focused on prime markets, mainly in the cities of Milan and Rome. Investors, due to this reason, in the next years, would look for assets in secondary markets to increase their competitiveness. In these markets is important to evaluate which assets could be more competitive and grant higher rent to land lords. The EPC, as it is in Italy, could offer a good instrument for investors to search for more appealing products, anyway the Energy performance Certificate could be improved in some points. In particular, in the residential sector, it's necessary to increase the awareness of seller of how the Energy Performance Certificate can boost the market value of houses. Most of the time in fact, the Energy Performance Certificate is not perceived by the selling side as a value adding activity to improve the marketability of the asset, but just as a tax to be paid to obtain the Certificate and being allowed to set the asset for sale. In Italy there are even case of certification provided through online website in less than 48 hours by paying less than €50,00. As analysed in the second chapter one of the mandatory elements when issuing an Energy Performance Certificate is the visit to the site[53], that of course through a website in less than 48 hours is not feasible. Moreover, in Italy there is not a differentiation between independent experts, as happen in Denmark. As analysed in *Chapter 2*, Danish qualified experts are divided in two categories: the first one represents experts which are allowed by law to provide certification for residential buildings or building smaller than 500 square meters while a second category of expert that is enabled to provide certification to all other categories of building. This differentiation, could improve the quality of Energy Performance certificate, specifically should be very important for those assets class, that could increase their value through a premium rent. In these cases, is important to have a precise value, defined by an independent expert, that certificate how much are energy consumes for the buildings under standard use.

In the third chapter the analysis focused its attention on the literature, to find evidence that the Energy Performance Certificate represent a premium in the definition of the market value of buildings. Evidences has been looked around the most important and more advanced market in the world, the paper that had been analysed come from the UK, The Netherlands, the United States and from Italy as well. In details, from the Dutch market have been provided some very important analysis, that became part of the initial assumption for this work. As analysed by several studies, which underlined the correlation between the energy efficiency and the values of buildings, the higher value of "green Buildings" is mainly represented by a premium coming from the present value of future energy savings. Moreover, has

[53] MD 26/2015 Article 4, Paragraph 6

been observed by several advisory companies[54], and reported in *Chapter 3*, most of the companies tend to choose for more performing building by making their choice under the so-called ceteris paribus condition. In our specific case this condition means that, if the sum of the rent and the operating cost deriving from energy expenses is kept stable over time, and so the total housing cost is equal, companies would prefer for more performing buildings.

Under these premises the aim of this thesis was define the premium value of the labels defined in the Energy Performance Certificate in the Italian Real Estate Market, specifically analysing three major asset class, Office, Retail and Residential. The three categories of buildings are very different one from the other, but, represent a good point to start the research. In fact, Office buildings represents the largest investment market in Italy, Retail buildings represent a kind of building that are probably one of the more energy intensive in the market and so the energy savings could represent a huge benefit for tenants, and at last Residential sector, probably the most common investment area among small private investors. In *Chapter 4* has been defined a model through which is possible to define the premium market value of the buildings, that has been considered as a premium resulting from the savings generated by more performing buildings. The results of the model are synthetized in *Figure 6.1.1* (for whom concern the Office Buildings), in *Figure 6.1.2* (for whom concern Retails buildings) and in *Figure 6.1.3* (for whom concern residential buildings).

The matrix showing the premium value for office spaces for each energy label is the synthesis of the Net Present Value of savings deriving from future expenses, calculated over a period of 12 years.

[54] A Corporate survey has been conducted by Jones Lang LaSalle and Core Net Global in 2011.

| Label | A4 | A3 | A2 | A1 | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|---|---|---|
| | Premium market value €/sqm calculated as difference between Energy expenses, for each energy label, calculated over 12 years | | | | | | | | | |
| A4 | 0,00 | -14,05 | -42,15 | -70,25 | -84,30 | -133,47 | -165,64 | -266,94 | -372,31 | -435,53 |
| A3 | 14,05 | 0,00 | -28,10 | -56,20 | -70,25 | -119,42 | -151,59 | -252,89 | -358,26 | -421,49 |
| A2 | 42,15 | 28,10 | 0,00 | -28,10 | -42,15 | -91,32 | -123,49 | -224,79 | -330,16 | -393,39 |
| A1 | 70,25 | 56,20 | 28,10 | 0,00 | -14,05 | -63,22 | -95,39 | -196,69 | -302,06 | -365,29 |
| B | 84,30 | 70,25 | 42,15 | 14,05 | 0,00 | -49,17 | -81,34 | -182,64 | -288,01 | -351,24 |
| C | 133,47 | 119,42 | 91,32 | 63,22 | 49,17 | 0,00 | -32,17 | -133,47 | -238,84 | -302,06 |
| D | 165,64 | 151,59 | 123,49 | 95,39 | 81,34 | 32,17 | 0,00 | -101,30 | -206,67 | -269,89 |
| E | 266,94 | 252,89 | 224,79 | 196,69 | 182,64 | 133,47 | 101,30 | 0,00 | -105,37 | -168,59 |
| F | 372,31 | 358,26 | 330,16 | 302,06 | 288,01 | 238,84 | 206,67 | 105,37 | 0,00 | -63,22 |
| G | 435,53 | 421,49 | 393,39 | 365,29 | 351,24 | 302,06 | 269,89 | 168,59 | 63,22 | 0,00 |

*Figure 0.1 Energy cost matrix developed for 20 years analysis, among each energy label for office buildings*

Through a cross-reference of Data in *Figure 6.1.1*, those values could be used to define a comparison between two buildings of the same asset class and in very similar conditions but having as main difference the labels of the Energy Performance Certificate. Moreover, as already described in *Chapter 4* those value, which represents a Market Value (€/sqm), can be used to define the Premium Rent for buildings, simply by multiplying them by a cap rate, or yield. The Premium Annual Rent for a Building labelled as A4 based on a C one, with a 5% yield define an increase in Rent equal to € 6,68 /sqm per year.

The same matrix had been developed for the other two assets class analysed in the work, Retail Buildings in *Figure 6.1.2* and Residential Buildings in *Figure 6.1.3*.

| Label | A4 | A3 | A2 | A1 | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|---|---|---|
| | Premium market value €/sqm calculated as | | | | | | | | | |
| | difference between Energy expenses, for each energy label, calculated over 12 years | | | | | | | | | |
| A4 | 0,00 | -18,81 | -56,43 | -112,87 | -131,68 | -178,70 | -253,95 | -357,41 | -498,49 | -583,14 |
| A3 | 18,81 | 0,00 | -37,62 | -94,05 | -112,87 | -159,89 | -235,14 | -338,60 | -479,68 | -564,33 |
| A2 | 56,43 | 37,62 | 0,00 | -56,43 | -75,24 | -122,27 | -197,52 | -300,98 | -442,06 | -526,71 |
| A1 | 112,87 | 94,05 | 56,43 | 0,00 | -18,81 | -65,84 | -141,08 | -244,54 | -385,62 | -470,27 |
| B | 131,68 | 112,87 | 75,24 | 18,81 | 0,00 | -47,03 | -122,27 | -225,73 | -366,81 | -451,46 |
| C | 178,70 | 159,89 | 122,27 | 65,84 | 47,03 | 0,00 | -75,24 | -178,70 | -319,79 | -404,44 |
| D | 253,95 | 235,14 | 197,52 | 141,08 | 122,27 | 75,24 | 0,00 | -103,46 | -244,54 | -329,19 |
| E | 357,41 | 338,60 | 300,98 | 244,54 | 225,73 | 178,70 | 103,46 | 0,00 | -141,08 | -225,73 |
| F | 498,49 | 479,68 | 442,06 | 385,62 | 366,81 | 319,79 | 244,54 | 141,08 | 0,00 | -84,65 |
| G | 583,14 | 564,33 | 526,71 | 470,27 | 451,46 | 404,44 | 329,19 | 225,73 | 84,65 | 0,00 |

*Figure 0.2 Energy cost matrix developed for 20 years analysis, among each energy label for retail buildings*

| Label | A4 | A3 | A2 | A1 | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|---|---|---|
| | Premium market value €/sqm calculated as | | | | | | | | | |
| | difference between Energy expenses, for each energy label, calculated over 8 years | | | | | | | | | |
| A4 | 0,00 | -7,62 | -22,86 | -38,10 | -53,34 | -72,39 | -102,86 | -144,77 | -201,92 | -236,21 |
| A3 | 7,62 | 0,00 | -15,24 | -30,48 | -45,72 | -64,77 | -95,25 | -137,15 | -194,30 | -228,59 |
| A2 | 22,86 | 15,24 | 0,00 | -15,24 | -30,48 | -49,53 | -80,01 | -121,91 | -179,06 | -213,35 |
| A1 | 38,10 | 30,48 | 15,24 | 0,00 | -15,24 | -34,29 | -64,77 | -106,67 | -163,82 | -198,11 |
| B | 53,34 | 45,72 | 30,48 | 15,24 | 0,00 | -19,05 | -49,53 | -91,44 | -148,58 | -182,87 |
| C | 72,39 | 64,77 | 49,53 | 34,29 | 19,05 | 0,00 | -30,48 | -72,39 | -129,53 | -163,82 |
| D | 102,86 | 95,25 | 80,01 | 64,77 | 49,53 | 30,48 | 0,00 | -41,91 | -99,05 | -133,34 |
| E | 144,77 | 137,15 | 121,91 | 106,67 | 91,44 | 72,39 | 41,91 | 0,00 | -57,15 | -91,44 |
| F | 201,92 | 194,30 | 179,06 | 163,82 | 148,58 | 129,53 | 99,05 | 57,15 | 0,00 | -34,29 |
| G | 236,21 | 228,59 | 213,35 | 198,11 | 182,87 | 163,82 | 133,34 | 91,44 | 34,29 | 0,00 |

*Figure 0.3 Energy cost matrix developed for 20 years analysis, among each energy label for residential buildings*

As already mentioned these three matrixes developed could be used by landlords to define the Premium Rent for their buildings. For instance, in case of two landlords owning two building in the same business district, this matrix could be used to define the premium rent or the rent reduction that should be applied to the buildings to be as competitive as the neighbour or achieve better financial results than the competitors. As already described the process is very simple in fact, knowing that the premium value in the matrixes report a value in €/sqm, we can define the Premium rent by using the Cap Rate formula, simply by multiplying the value in the table by a yield (Rent=Value x Yield). Moreover, this instrument in form of the Premium Rent could be a very important tool to landlord helping them to define the feasibility of renovation project, which aims is to increase the energy efficiency of the building. In fact, it could allow investors to better evaluate the payback time of the improvement works, not only considering a cost reduction of the project but an increase in rent.

These matrixes, could be used as they are, specifically in case of small and medium investments, where the evaluation is defined through a multi-parametric market comparison approach. In case of small investment as may be a single flat, a small commercial unit, or a offices units, the matrix could be used to help defining the value. Through the matrix, can easily be defined the so-called correction factor known as “k”. The corrective factor “k” should be then multiplied to the price of the comparable to obtain an objective Market Value of the unit under analysis.

As already mentioned the results obtained in the model from *Chapter 4* had been tested in *Chapter 5*, through the discounted cash flow analysis. The aim of the analysis was to define which could be the impact of the energy label for investments, where are considered more factor than the simple Cap Rate formula: V=R/i[55], described in *Paragraph 1.1.3*. In fact, the evaluation takes into account both the positive and negative flows of money, discounting the cost of capital over time. The methodology that should be followed to determine the Objective market value of a building is synthetized in *Figure 6.1.4*, where are shown the three main phase of the analysis.

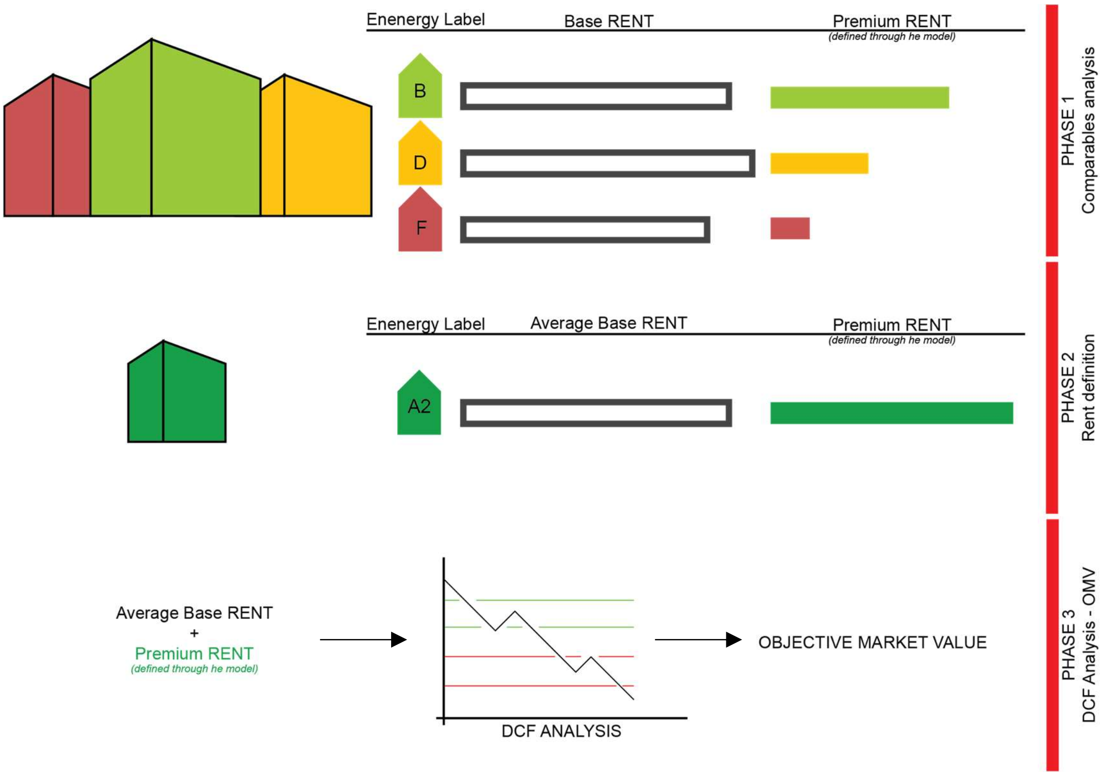



*Figure 0.4 scheme of the 3 phase, to define the objective market value of a building or building unit.*

In the Phase 1 of the scheme we can see the Analysis of the Comparables, where the analysis should aim at finding property in the neighbourhood, that have recently been leased, and at which terms of lease (mainly represented by the value of the

[55] Price of a property is equal to rent divided by the cap rate

annual rent, step-up rents or more in general incentives). As we have described in *Chapter 3* the total housing cost taken into account by this work are represented by three factors: a Base Rent, the Energy Cost and the Premium Rent. Knowing the Total Rent, we can define easily define the Premium Rent through the matrix and then obtain the Base Rent by subtracting the Premium from the Total Rent. The average among the Base Rent of the comparable could be then used to define the Average Market Base Rent for the area.

To define the Objective market value of the building we want to evaluate, in the second phase of F*igure 6.1.4* we should then sum the Average Market Base Rent with the Premium Rent defined in the matrix and we should obtain the total rent. After the definition of the rent, in the third phase of *Figure 6.1.4* the analysis go in deeper through the Discounted Cash Flow model, in which positive and negative cash flow over time are discounted by an interest rate, to define the today value of future cash flows. The Objective Market Value is so represented in this methodology, by an initial investment that return a positive value in the Net Present Value, with an Internal Rate of Return large enough for the investors.

This methodology developed in *Chapter 5* shows that returns are not large as much as expected from *Figure 6.1.1*, *6.1.2* and *6.1.3*, but even very small variation in the Premium Rents reflects in an increase or decrease in Value of the Building. What has been observed in *Case 2*, is that major benefits of the premium rent give great benefits on secondary Markets, where Rent are lower and yield required by the landlord are higher if compared to the Prime Markets. In these cases, the benefits given by the Energy Label in absolute terms are equal to the one obtained in the prime market, but in proportion are much higher. By using the model defined in this thesis is possible to define which is the market value of the Energy Performance Certificate.

An element that could grant a huge improvement to this work should be evaluate the real duration of the Energy Performance Certificate. According to both Italian Law and European directives, the Certificate has a standard duration of ten years[56]. Ten years are a quite long-time frame, in fact in this time period building components would certainly suffer from a constant obsolescence that will gradually decrease the Energy Performance Certificate standards. Even more, in some cases due to poor maintenance condition, building components would suffer also from a constant deterioration that could effectively reduce the global energy performances of the building. The Premium rent so, should probably be updated according to some index according to the obsolescence of the EPC. That index should not reduce the value of the Premium Rent in a linear way but should decrease slowly in the first years and then increase over time. This Index, should also keep into account the update required by the European Union as increase in standard for each label, that would be constantly update, to reduce the energy consumes of buildings.

A further improvement to this work can be granted by some precise analysis of the Italian Real Estate market. In fact, now is hard to define which among the Energy labels represent the average price of the Italian market. According to data evaluated in *Chapter 1* the most common Energy label in every sector is the G one, but data are not enough disaggregated to make a deep investigation. The problem has been partially solved by defining a matrix that allow to compare each class with the other, but further and deeper studies are required to be more precise in the evaluation. This kind of analysis can be defined through a regression analysis of a big samples of data of real estate properties by taking into account different factors like the size of the buildings.

[56] The Energy Performance Certificate should be reissued only if the Building is subject to major renovation works both to system or the envelope.

One of the biggest limit of the model is referred in the cap rate expressed in the *Chapter 4*. Yields cannot be higher than the 8.3% in case of buildings under art. 27 of law 392/78 (that has a standard duration of 6+6 years). In fact according to what has been said before, tenants would accept to pay a premium rent in case the total housing cost is going to be fixed, i.e. the sum of rents and operating cost is equal. But if we consider a cap rate higher than 8,3% the tenants is going to pay a price that is higher than the energy expenses, and so he has no advantages from being in a more performing building.

This same model could be applied to the whole residential sector, not only to the one regarding the investment sector, assets bought and sold to be rented to third parties. In fact even an end user will benefits from future savings from being located in a more performing building. The difficulty lies in finding the correct duration of the analysis, in fact it should be technically be the average of the different life cycle of components that could influence the performance of the building, like windows, heating systems, conditioning systems, lighting system, elevators, façade insulation etc; but a too long time frame like 20 years could not represents a realistic duration due to a constant deterioration of the components.

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