EUB SuperHub

European Building Sustainability performance and energy certification Hub

D1.4 – EPCs, sustainability certifications and buildings' green value

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1. table

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Project partners involved

Partner number	Acronym	Partner name	Country	Country code
2	**HM**	Hochschule für angewandte Wissenschaften München	Germany	DE
3	**iiSBE**	International Initiative for a Sustainable Built Environment Italia R&D	Italy	IT
5	**EIV**	Energieinstitut Vorarlberg	Austria	AT
8	**CSTB**	Centre Scientifique et Technique du Bâtiment	France	FR
9	**UCC**	University College Cork	Ireland	IE
10	**EIHP**	Energetski institut Hrvoje Požar	Croatia	HR

Abbreviations

BER	Building Energy Rating (used in Ireland)
BREEAM	Building Research Establishment Environmental Assessment Methodology (green building rating system developed by the Building Research Establishment for rating the sustainability of buildings
DBL	Digital Building Logbook
DCF	Discounted-Cash Flow
DHW	Domestic Hot Water
EBVS	European Business Valuation Standards
EE	Energy Efficiency
EPBD	Energy Performance of Buildings Directive
EPC	Energy Performance Certificate
ESG	Environmental, Social and Governance
EVCS	European Voluntary Certification Scheme (ALDREN project)
EVS	European Valuation Standards
GHG	Greenhouse Gases
GRESB	Global Real Estate Sustainability Benchmark
IVS	International Valuation Standards
IVSC	The International Valuation Standards Council
JRC	Joint Research Centre
KPI	Key Performance Indicator
LCA	Life Cycle Assessment
LCC	Life Cycle Cost
LEED	Leadership in Energy and Environmental Design (green building rating system developed by U.S. Green Building Council)
LNG	Liquefied Natural Gas
nZEB	nearly-Zero Energy Building
RICS	Royal Institution of Chartered Surveyors
RTB	Residential Tenancies Board (used in Ireland)
SC	Sustainability Certificate
SCSI	Society of Chartered Surveyors Ireland
TEGoVA	The European Group of Valuers' Associations

Executive summary

Reliable and trusted building valuations, considering energy efficiency and sustainability improvements and certifications, is crucial to ensuring high standards.

One of the objectives of the first work package (WP1 Baseline assessment and definition for EUB SuperHub) is to identify key elements to raise the impact of energy efficiency improvements and certifications on the value of buildings within the last task named *1.4 Impact of energy efficiency improvements and certifications on the value of buildings*.

The following six EUB Super Hub partner countries are involved in this task: Germany, Italy, Austria, France, Ireland, and Croatia.

Within this task the following topics are analysed:

1. Review of existing literature about the impact of energy efficiency and sustainability improvements on the value of buildings covering Europe,
2. Analysis of specific impacts of labels and certificates to create „green value",
3. Identification of elements for further raising the impact of the next generation EPCs on the real estate market.

Introduction

It is well known that the European building sector accounts for 40 % of Europe's total final energy consumption and is the main single contributor to GHG emissions accounting for 36 % of CO_2 emissions. Those numbers are cited in numerous publications for over a decade now stressing the importance to reduce energy consumption in the EU building stock, phasing out fossil fuels in heating and cooling by lowering the energy demand in the first instance, and by the deployment of renewable-based technologies.

Thanks to the European directive on the energy performance of buildings (EPBD directive) a lot has been already done. All new buildings must be built to the nearly zero energy building standard. According to the newest proposal for a directive on the energy performance of buildings (EPBD directive) published in December 2021, a definition of zero-emission building is introduced specifying that as of 2030, all new buildings must be zero-emission buildings and as of 2027 all new public buildings be zero-emission buildings. The zero-emission buildings will become the new standard for all new buildings very soon requiring that all new buildings do not generate on-site carbon emissions from fossil fuels and that the very low energy demand needs to be fully covered by energy from renewable sources. On-site renewables such as solar thermal, solar photovoltaics, heat pumps and biomass, renewable energy ideally should be provided by renewable energy communities or citizen energy communities, and district heating and cooling based on renewables or waste heat.

Although we are all aware that EU's building stock is the single largest energy consumer in Europe (heating, cooling, and domestic hot water account for 80 % of energy consumed by citizens in buildings), the rate of existing building energy renovations is still very low. Only about 1% of the building stock is renovated each year. Therefore, it certainly would not be possible to achieve a zero-emission building stock by 2050 if continuing with the same renovation rate. To increase the rate and depth of existing buildings renovations, making existing buildings more energy efficient and less dependent on fossil fuels and to achieve climate neutrality in building stock by 2050, the newest proposal of the EPBD directive introduces so called minimum energy performance standards for the worst-performing existing buildings. The introduction of minimum energy performance standards will lead to a gradual phase-out of the worst-performing buildings and a continuous improvement of the national building stock, contributing to the long-term goal of a decarbonised building stock by 2050.

In the context of the current energy crisis and EU's climate goals it is more than ever of utmost importance to reduce EU dependence on fossil fuels in the existing building stock across the EU.

To decarbonise the building sector there are nowadays many well-proven active and passive energy efficiency measures that can reduce energy losses in buildings. Through thermal insulation of the building envelope, efficient glazing, elimination of thermal bridges and leaks, and installation of efficient heating/cooling system energy use for heating/cooling can be drastically reduced. There are also valuable passive design options that could be implemented such as optimised spatial

planning, building orientation, natural ventilation strategies and effective use of thermal mass, passive solar systems, passive heating, and passive cooling.

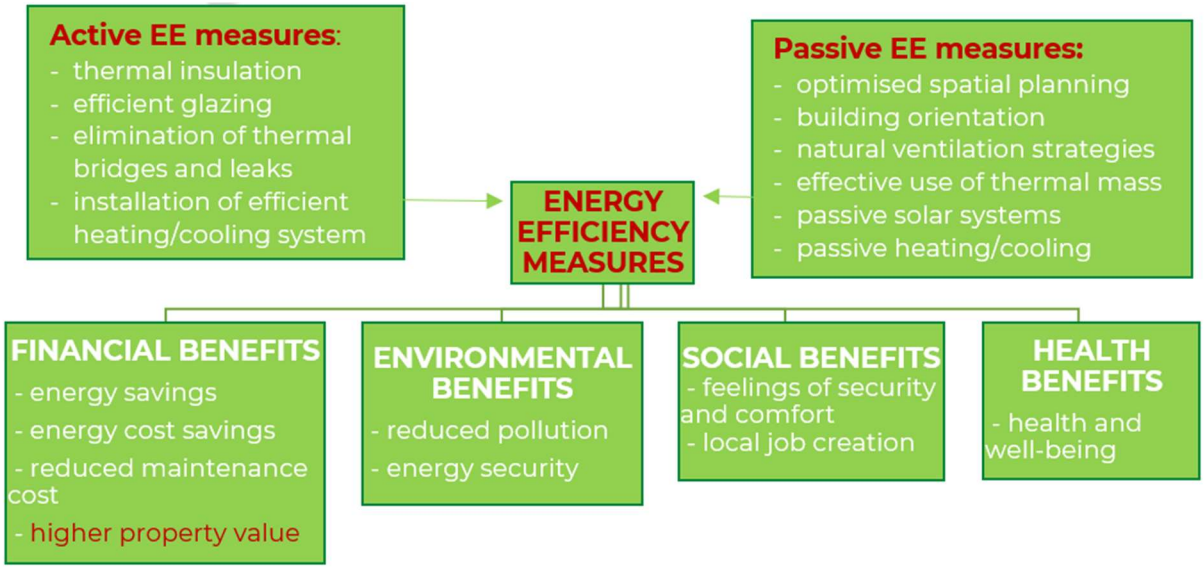

Figure 1: Benefits of energy-efficient buildings

All those energy efficiency measures produce tangible and less tangible benefits, which can be divided into the following groups:

- financial (or economic) benefits,
- environmental benefits (reduced pollution, energy security),
- social benefits (feelings of security and comfort, local job creation),
- health benefits (health and well-being).

One of the most significant financial benefits is certainly energy savings closely linked to energy cost savings. In most existing energy performance certification schemes, energy savings and associated energy costs including carbon savings due to the deployment of energy efficiency measures in the usage phase are only considered.

It is important to consider energy-related costs, but there are many other costs along the remaining building lifespan that need to be considered to have the whole picture of financial (economic) benefits associated with energy, health, and well-being such as:

- maintenance costs,
- running costs,
- replacement cost,
- GHG costs (it is expected that the proposed new emissions trading system will be introduced for buildings).

All those easily expressed costs can be considered as direct benefits to the building owner. There are also less tangible indirect non-energy benefits resulting from benefits to other stakeholders such as: increased asset attractiveness, reduced obsolescence, higher rents, and lower risk of vacancy, and better quality of living.

Also, in the newest proposal of EPBD directive it is stressed that building renovation has two widely recognised positive economic impacts:

1. decreasing energy costs, alleviating energy poverty,

2. increasing the value of more energy performing buildings.

There is no doubt that energy efficiency and sustainability improvements in theory should influence building value. Therefore, the following questions arise in each project partner country:

- to which extent are certain energy efficiency features and different sustainability aspects considered when performing a building appraisal/valuation?
- which are real key drivers impacting appraised value of a building nowadays?
- do appraisals/valuations adequately recognize the importance of energy efficiency?

This deliverable has the following aims:

1. to review existing literature about the impact of energy efficiency and sustainability improvements on the value of buildings,
2. to analyse specific impacts of labels and certificates to create „green value",
3. to identify elements for further raise the impact of the next generation EPCs on real estate market.

In the first chapter entitled *1. Institutions, regulations, and standards for property valuation* the brief description of the three most important international institutions for property valuations (IVSC, TEGoVA, RICS) is given and an overview of the last editions of valuation standard is presented. Also, a list of regulations in the field of real estate valuation valid in each EUB Superhub partner country is provided giving brief description of valuation approaches used in each project partner country. The main goal of this chapter was to detect to what extent are energy efficiency and sustainability taken into consideration through currently available standards and regulations.

The second chapter (*2. Review of existing literature*) gives a literature review about the impact of energy efficiency and sustainability improvements on the value of buildings in Europe. The review of existing literature identified several European projects (ZEBRA 2020, REVALUE, CA EPBD IV, EeMAP, EeDaPP, ALDREN, LIFE Level(s)), many articles within international journals and journals at national level, providing research analysis and surveys on real estate market (e.g., Italy), and initiatives and insight papers from various organisations dealing with real estate valuation considering energy efficiency.

To analyse the current specific impact of energy efficiency and sustainability labels/improvements on the value of buildings, expert interviews with real estate agents and valuers in project partner countries (Italy, Austria, France, Ireland, and Croatia) are presented within third chapter (*3. Analysis of specific impact of labels and certificates*).

Based on the conducted extensive literature review (Chapter 2) and expert interviews among real estate agents and valuers (Chapter 3) the elements to further raise the impact of the next generation EPCs on real estate market are identified within the chapter 4 (*4. Identification of elements to further raise the impact of the next generation EPCs on real estate market*).

1 Institutions, regulations, and standards for property valuation

In this chapter a brief description of three most important international institutions for property valuations is given. An overview of the last editions of valuation standard is also presented. Also, a list of regulations in the field of real estate valuation and their brief description is given for each EUB SuperHub partner country (Germany, Italy, Austria, France, Ireland, and Croatia). A brief description of available valuation approaches is given too.

1.1 International institutions for property valuation

The three most important international institutions for property valuations which operate across countries and set valuation standards at the national and international levels are:

- the International Valuation Standards Council (IVSC),
- the European Group of Valuers' Association (TEGoVA),
- the Royal Institution of Chartered Surveyors (RICS).

Figure 2: Recognisable logos of the most important international institutions for property valuations

1.1.1 The International Valuation Standards Council (IVSC)

The International Valuation Standards Council (IVSC) (https://www.ivsc.org/) is a non-profit organisation that acts as the global standard setter for the valuation profession, serving the public interest. Their mission is to raise standards of valuation practice by:

- developing high-quality International Valuation Standards (IVS) which ensure consistency, transparency, and comparability,
- encouraging the adoption of international valuation standards (IVS), along with valuation professionalism provided through Valuation Professional Organisations (VPOs) throughout the world.

The International Valuation Standards Council (IVSC) issues International Valuation Standards (IVS).

1.1.2 The European Group of Valuers' Association (TEGoVA)

The European Group of Valuers' Association (TEGoVA) (https://tegova.org) is a non-profit organisation established in Brussels, under Belgian Law.

TEGoVA is the European umbrella organisation of national valuers' associations. Its main objective is the creation and spreading of harmonised standards for valuation practice, for education and qualification as well as for corporate governance and ethics for valuers. It supports its member associations in the introduction and implementation of these standards.

TEGoVA brings together 72 national valuers' associations from 38 countries 70 000 qualified valuers (as of January 2021), both in and outside the EU.

All project partners countries involved in this project (Germany, Italy, Austria, France, Ireland, and Croatia) are members of TEGoVA.

In the table below the members of TEGoVA are listed for each EUB Super Hub partner country. In Ireland, there is only one member of TEGoVA (Institute of professional auctioneers&valuers). Croatia has also one member of TEGoVA (Croatian association of court expert witnesses and valuers), whereas in all other EUB SuperHub project countries there is more than one association representing as a member of TEGoVA.

Table 1: Members of TEGoVA in the EUB SuperHub partner countries

Partner countries	Members of TEGoVA in original language	Members of TEGoVA translated into English
Germany	Bund der öffentlich bestellten Vermessungsingenieure e.V. (BDVI)	German Association of Publicly Appointed Surveyors
	Bundesverband öffentlich Bestellter und Vereidigter sowie qualifizierter Sachverständiger (BVS)	Association of Publicly Certified and Qualified Experts
	Immobilienverband Deutschland IVD Bundesverband der Immobilienberater, Makler, Verwalter, und Sachverständigen e.V.	German Real Estate Professional Association
Italy	ASSOCIAZIONE SOCIETÀ DI VALUTAZIONI IMMOBILIARI (ASSOVIB)	Association of Property Valuation Companies
	CONSIGLIO NAZIONALE GEOMETRI e GEOMETRI LAUREATI (CNGeGL)	National Council of Italian Surveyors
	ISTITUTO ITALIANO di VALUTAZIONE IMMOBILIARE (IsIVI)	Italian Institute for Real Estate Valuation
	ISTITUTO di ESTIMO e VALUTAZIONE (IEV)	E-Valuations - Institute of Estimation and Valuation
Austria	Österreichischer Verband der Immobilienwirtschaft (ÖVI)	Austrian Real Estate Association
	IR Immobilienring Österreich	IR Immobilienring Austria
France	ASSOCIATION FRANÇAISE DES SOCIÉTÉS D'EXPERTISE IMMOBILIÈRE (AFREXIM)	French Association of Property Valuation Companies
	CHAMBRE DES EXPERTS IMMOBILIERS DE FRANCE (CEIF-FNAIM)	Chamber of Real Estate Valuers of France
	COMPAGNIE NATIONALE DES EXPERTS IMMOBILIERS (CNEI)	National Company of Real Estate Experts
	CONFÉDÉRATION DES EXPERTS FONCIERS (CEF)	Confederation of Property Valuers
	CONSEIL SUPÉRIEUR DU NOTARIAT (CSN)	High Council for the Notarial Profession
	INSTITUT FRANCAIS DE L'EXPERTISE IMMOBILIÈRE (IFEI)	French Institute of Real Estate Valuation
	SYNDICAT NATIONAL DES PROFESSIONNELS IMMOBILIERS (SNPI)	National Association of Real Estate Professionals
	UNION DES SYNDICATS DE L'IMMOBILIER (UNIS)	National Union of Property Professions
Ireland	Institute of professional auctioneers&valuers (IPAV)	Institute of professional auctioneers&valuers
Croatia	Hrvatsko društvo sudskih vještaka i procjenitelja (HDSVIP)	Croatian association of court expert witnesses and valuers

All those members of TEGoVA have awarding rights to administer the Recognised European Valuer (REV), and the TEGoVA Residential Valuer (TRV) status as governed by TEGoVA.

The European Group of Valuers' Association (TEGoVA) issues European Valuation Standards (EVS, the Blue Book) and European Business Valuation Standards (EBVS).

1.1.3 The Royal Institution of Chartered Surveyors (RICS)

The Royal Institution of Chartered Surveyors (RICS) (https://www.rics.org), founded in London in 1868, is a UK-based professional body for surveyors. It works at a cross-governmental level and aims to promote and enforce the highest international standards in the valuation, management and development of land, real estate, construction, and infrastructure.

The Royal Institution of Chartered Surveyors (RICS) issues RICS Valuation – Global Standards (also called Red Book).

The concept of "green value" or "green premium" was firstly introduced by the RICS in 2005. In Europe the term "green value" refers mostly to energy efficiency and low carbon features whereas in the United States, "green value" is used to refer to a variety of sustainability and environmental properties (including water and waste efficiency and resilience to flooding, even for social aspects).

1.2 Regulations and standards

In this chapter, an overview of the currently available international and European valuation standards is given. Within first step it was important to explore the norms and standards by which valuers operate.

The following regulations and guidance books are most widely accepted:

- **The International Valuation Standards** (IVS) are standards for undertaking valuation assignments using generally recognised concepts and principles that promote transparency and consistency in valuation practice.
- TEGoVA publishes the **European Valuation Standards** (focused on 5 topics) since the early 1980s as part of the European Valuation Standards (EVS), i.e., the "**Blue Book**".
- The RICS publishes the "**Red Book**" (latest in 2017: Global Red Book) to provide the mandatory requirements and advisory Valuation Practice Guidance Applications (VGPAs) that should be followed by valuers to remain consistent with IVSC international standards.

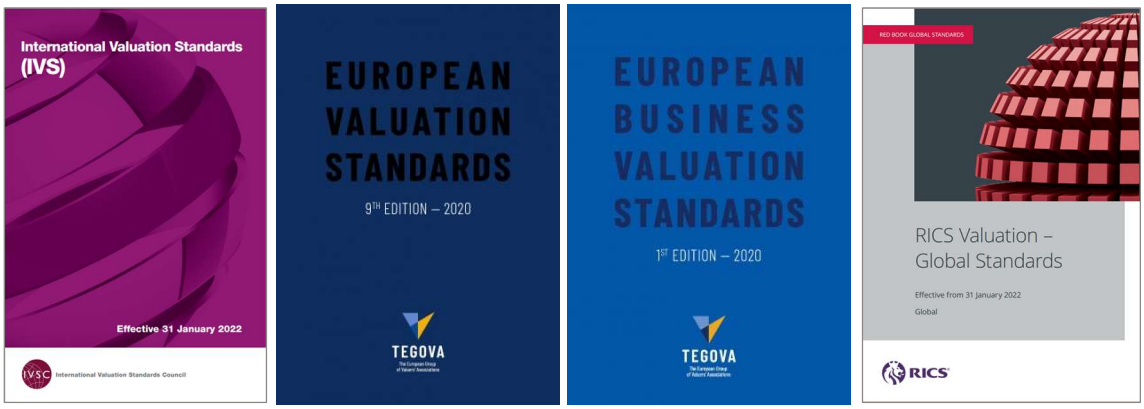

Figure 3: Recognisable first pages of most known international and European valuation standards

Also, a list of regulations in the field of real estate valuation and their brief description is given for each EUB SuperHub partner country (Germany, Italy, Austria, France, Ireland, and Croatia).

The main goal is to detect how energy efficiency and sustainability impact the value of buildings and to what extent are taken into consideration through currently available standards and regulations.

The International Valuation Standards Council (IVSC), the European Group of Valuer ' s Associations (TEGoVA), and the valuation standards of the Royal Institute of Chartered Surveyors (RICS) already integrate sustainability as an aspect to consider.

1.2.1 International Valuation Standards

The last edition of International Valuation Standards (IVS), developed and published by the International Valuation Standards Council (IVSC), available at www.ivsc.org, effective from January 2022, serve as the key guide for valuation professionals globally to underpin consistency, transparency, and confidence in valuations.

IVS comprises:

- five 'General Standards',
- eight 'Asset-specific Standards'.

The General Standards set requirements for the conduct of all valuation assignments, including establishing the terms of a valuation engagement, bases of value, valuation approaches and methods, and reporting. The General standards cover:

- IVS Framework
- IVS 101 Scope of Work
- IVS 102 Investigations and Compliance
- IVS 103 Reporting
- IVS 104 Bases of Value
- IVS 105 Valuation Approaches and Methods

The Asset standards include requirements to specific types of asset valuation and additional asset-specific requirements regarding common valuation approaches and methods used covering the following:

- IVS 200 Businesses and Business Interests

- IVS 210 Intangible Assets
- IVS 220 Non-Financial Instruments
- IVS 230 Inventory
- IVS 300 Plant and Equipment
- IVS 400 Real Property Interests
- IVS 410 Development Property
- IVS 500 Financial Instruments

There is no chapter within IVS referring to either energy efficiency or sustainability.

Sustainability is mentioned only once in IVS 410 Development Property. It is stated that among others sustainability and any client requirements in relation to green buildings need to be considered for specific investigation when undertaking a valuation of a development property before a project commences.

1.2.2 European Valuation Standards

The European Group of Valuers' Association (TEGoVA) issues European Valuation Standards (EVS, the Blue Book) and European Business Valuation Standards (EBVS). TEGoVA has published European Valuation Standards since the early 1980s.

The last edition of those two standards, developed and published by TEGoVA are:

- the 9th edition of **European Valuation Standards** (EVS 2020, also called The Blue Book), which is valid form January 1st, 2021,
- the 1st edition of **European Business Valuation Standards** (EBVS), which provides fundamentals of best practice in business valuation.

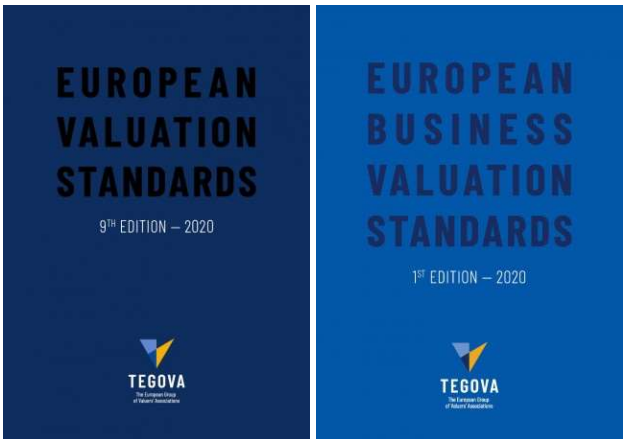

Figure 4: The last versions of European Valuation Standards developed and published by TEGoVA

The chairman of the European Valuation Standards Board Michael P. Reinberg stressed out that the 9th edition of European Valuation Standards (EVS 2020) enhanced European Valuation practice with:

- greater clarity on the key concept of Market Value, compensating flaws that have crept into various language versions of EU law,
- a common European Valuation Report for Residential Property,
- **energy efficiency valuation upgraded to standard level**,
- New Guidance Notes and Information Papers on subjects of real interest to practicing valuers,

- clarification of the role of advanced statistical models in line with the new EBA Guidelines,
- a comprehensive approach to Valuation Methodology including detailed exposition of key concepts such as income approach and depreciated replacement cost,
- a unique, landmark exposé of European Union Legislation and Property Valuation enabling practicing valuers to understand how much of the real estate regulatory environment is based on EU law, equally valuable to European and national supervisory authorities, policy makers and academics.

The 9th edition of European Valuation Standards (EVS 2020), effective from January 2021, comprises the following seven parts:

I. European Valuation Standards and Guidance Notes

II. Valuation Methodology

III. Valuation and Sustainability

IV. European Valuation Information Papers

V. Measurement, Education and Qualifications

VI. European Valuers' Code of Conduct

VII. European Union Legislation and Property Valuation

1.2.2.1 Energy efficiency

The first part within EVS 2020 named *I. European Valuation Standards and Guidance Notes* comprises European valuation standards and European valuation guidance notes.

The European valuation standards cover:

EVS 1 Market value

EVS 2 Valuation bases other than market value

EVS 3 The qualified valuer

EVS 4 The valuation process

EVS 5 Reporting the valuation

EVS 6 Valuation and energy efficiency

Within *EVS 5 Reporting the valuation* the content of the EVS valuation report for residential property is given.

EVS 6 Valuation and energy efficiency; "refers to energy efficiency and new upcoming EPBD revision. EVS 6 advises valuers to integrate the cost of energy efficiency valuation in their determination of market value when the obligation to energy renovate is imposed by law by a fixed date or at a certain inflection point (e.g., rental, sale).

It is stated that EU has traditionally energy-regulated the building stock via Directives and the main significant impacts have been:

- the obligation to energy efficiency improvement when the owner freely decides to undertake a major renovation,

- all new buildings must be nearly-zero energy buildings,
- member states must energy renovate 3 % of central government buildings every year,
- buildings put up for rent or sale must have an energy performance certificate (EPC) with a rating,
- regular inspection of heating and cooling systems.

All this is nowhere near enough to reach the EU targets. Currently, the owner of a worst-performing building retains control over when to renovate. The situation will be soon changed with the new upcoming EPBD revision.

The proposal for revision of the Energy Performance of Buildings Directive (EPBD), published officially on the web site of the European Commission on December 15th, 2021, introduced the whole set of novelties such as introduction of minimum energy performance standards, zero emission buildings, renovation passports, digital building logbooks, smart buildings etc. Zero-emission building is defined as a building with a very high energy performance, where the very low amount of energy still required is fully covered by energy from renewable sources generated on-site, from a renewable energy community or from a district heating and cooling system. The main goal of the upcoming EPBD revision is:

- to trigger energy renovation of the worst-performing existing buildings,
- to increase the rate and depth of buildings renovations,
- to reduce buildings' greenhouse gas (GHG) emissions and final energy consumption,
- to make buildings more energy efficient and less dependent on fossil fuels,
- to ensure that all buildings will be in line with the 2050 climate neutrality requirements.

This proposal specifies that as of 2030, all new buildings must be zero-emission buildings, and all new public buildings must be zero-emission as of 2027.

The new upcoming EPBD revision will bring in a legal obligation to renovate a building to a higher level of energy efficiency by a fixed date or at a certain inflection point (e.g., rental, sale), which will create an unavoidable major cost that impacts market value, as the owner at that date or inflection point will have to pay for renovation works. Valuers will have to estimate the cost of a renovation deep enough to meet the required new level of energy efficiency or future requirements that are sufficiently close to coming into force and consider the extent to which these costs affect the market value at the date of valuation.

1.2.2.2 Sustainability

It is noteworthy, that EVS 2020 considers sustainability in the third part named *III. Valuation and sustainability*. The following topics are covered within the third part: 1. Introduction, 2. Sustainability, 3. Sustainability and property users, 4. Developing "green" standards for property, 5. Valuation and sustainability.

In this third part it is stated that valuers will need to call on relevant expertise, certification and reports which refer to property's sustainability. Valuers need to be able to understand what the specialist reports might mean (e.g., regarding environmental issues such as the assessment of contamination, asbestos, flood risk or soil erosion) and judge what weight to give to them. Although, sustainability has

economic, social and, environmental dimension, this third part focuses on the environmental aspects of sustainability. Sustainability is defined as improving the quality of human life while living within the carrying capacity of supporting ecosystems.

Valuers need to understand for each case whether addressing sustainability adds or subtracts value.

A "green" or "sustainable building" within EVS 2020 is defined as one that is identified as using resources such as energy, water, materials, and land more efficiently than buildings constructed to existing minimum standards.

When it comes to sustainability the following general checklist is recommended within the third part of EVS 2020:

- **location** – where relevant, is it accessible by public transport as well as private means?
- **the existing land use of a site for development** – there may be such issues as contamination or water management,
- **the risks to a building from threats** to its location such as flooding or earthquakes or those caused by its siting and design (as with flooding from hard surfaces),
- the design and layout of a building, covering issues from its expected life to its energy management, including materials (source, recycling, type, life) and resource efficiency,
- its quality as a working environment and so its impact on occupiers' health and efficiency, which can include ventilation and lighting,
- energy efficiency and sourcing,
- water efficiency,
- waste management,
- the building's resilience to potentially rising costs of energy, water, and waste management.

The most important notes from the topic *5. Valuation and sustainability*:

- 5.1. *A valuer can only provide an opinion of value on the basis of evidence, reflecting the experience of the marketplace.*
- 5.19. *Sustainability, energy efficiency and green features can only be reflected in the valuation where this is supported by observable market evidence. There is no reason to assume that meeting or failing to meet any aspect of sustainability will automatically and of itself see a premium or discount in the property's value. The impact of a feature may vary over time, between different sectors, uses or regions.*
- 5.20. *All existing valuation methods – mainly direct value comparison, income, and replacement cost –are suitable for the valuation of sustainable buildings. Comparable transactions are the best proof of the market's willingness to pay for certain building features.*
- 5.23. *One practical problem is that sustainability issues do not exist in isolation but as noted above, will overlap with other factors. For example, energy efficiency may be a virtue, a cost saving, allow a higher quality of working environment and be an aspect of a modern building which, as such, has lower maintenance costs, less need of refurbishment and may be*

in a more attractive location. Taken on its own, energy efficiency might not be the decisive factor in value.

- 5.24. *As a practical profession, valuation turns on observation and appraisal. In present circumstances, considering sustainability issues in relation to a property requires careful analysis. It may only rarely be that sustainability issues as a generality will be relevant, but more often that specific issues and particularly, specific standards will be of concern. Standards, certification, and rating regimes can summarise and encapsulate information on, say, energy in ways that the market may more easily take into account. It thus becomes more important to know how to:*
  - identify, describe, and assess the relevant characteristics of properties,
  - interpret and judge assessments of them,
  - consider whether they are already taken into account so far as they are relevant to value,
  - select the appropriate way to take any remaining points into account without double counting.
- 5.25. *Once relevant factors are identified and appraised in this way they can, in principle, be taken into account for valuations in just the same way as any other specific factors. They do not require new valuation methods but rather calm, practical assessment under the terms of the valuation basis instructed. They will need to be covered in the Valuation Report to the extent and in the manner that is appropriate.*
- *5.26. The extent to which the report refers to sustainability will be a matter of judgement in the circumstances. This will in part reflect the extent to which sustainability issues are relevant to the value and in part the interests of the client. These two points come together where a client interested in sustainability issues instructs a valuation on the basis of Investment Value.*
- *5.29. Alongside the usual description of the property, factors to consider might include:*
  - *construction materials,*
  - *any contamination of properties such as brownfield sites for development,*
  - *risks of natural disasters such as flooding, earthquakes, or avalanches,*
  - *compliance with relevant building standards,*
  - *insulation and related points (such as heat bridges or the type of windows) and quality in terms of durability and building standards,*
  - *nature and complexity of building services,*
  - *age and quality (efficiency) of the equipment in the building for heating, cooling, and other purposes and so the feasibility of maintaining or replacing specific building components (such as an oil-fired heating system compared with an alternative system that may reduce overall operating costs),*
  - *energy efficiency, EPC ratings and recommended measures for improving the property, energy sources (renewable?) and net energy demand,*
  - *water efficiency, especially in locations with scarce water supplies, using grey water, recycling of water, rainwater harvesting, etc.,*
  - *operating expenses,*

- *floor area in terms of usability, adaptability, and cost effectiveness,*
- *impact on users' productivity and well-being,*
- *likely timing and cost of refurbishment,*
- *market attitudes towards sustainability and willingness to pay for green features,*
- *requirements of legislation,*
- *possible financial support,*
- *relevant certifications or ratings,*
- *terms of leases ("green leases").*

It is noteworthy, that EBVS too considers sustainability in the business valuation process exploring the concept of green value and providing valuers with an initial checklist of possible points for sustainability review of a business. The entire Part III is devoted to sustainability.

1.2.3 RICS Valuation - Global Standards

The last edition of RICS Valuation – Global Standards (also called Red Book), published by the Royal Institution of Chartered Surveyors (RICS), available at www.rics.org , effective from January 2022, the same date as the latest edition of IVS becomes effective, reflects, among other things, the recent changes made and incorporated into the International Valuation Standards (IVS), as well as continuing progress in the development of international standards for ethics and for measurement.

The Red book comprises:

Part 1: Introduction

Part 2: Glossary

Part 3: Professional standards

Part 4: Valuation technical and performance standards

Part 5: Valuation applications

Part 6: International valuation standards

Within glossary of the red book two additional terms are defined as follows:

- **Environmental, social and governance** (ESG)
  "The criteria that together establish the framework for assessing the impact of the sustainability and ethical practices of a company on its financial performance and operations. ESG comprises three pillars: environmental, social and governance, all of which collectively contribute to effective performance, with positive benefits for the wider markets, society and world as a whole."
- **sustainability**
  "*Sustainability is, for the purpose of these standards, taken to mean the consideration of matters such as (but not restricted to) environment and climate change, health, and wellbeing, and personal and corporate responsibility that can or do impact on the valuation of an asset. In broad terms it is a desire to carry out activities without depleting resources or having harmful impacts.*

In some jurisdictions, the term 'resilience' is being adopted to replace the term 'sustainability' when related to property assets. Sustainability may also be a factor in environmental, social and governance (ESG) considerations."

Part 5: Valuation applications refers to RICS valuation practice guidance, provides implementation guidance in the specific instances listed as follows:

VPGA 1 Valuation for inclusion of financial statements

VPGA 2 Valuation of interests for secured lending

VPGA 3 Valuation of businesses and business interests

VPGA 4 Valuation of individual trade related properties

VPGA 5 Valuation of plant and equipment

VPGA 6 Valuation of intangible assets

VPGA 7 Valuation of personal property, including arts and antiques

VPGA 8 Valuation of real property interests

VPGA 9 Identification of portfolios, collections, and groups of properties

VPGA 10 Matters that may give rise to material valuation uncertainty

VPGA 8 provides detailed commentary on matters evident or to be considered during inspection of real estate, including those matters that fall within the general heading of 'sustainability and ESG matters'. Such factors are commonly important in terms of market and societal perception and influence, and valuers should have proper regard to their relevance and significance in relation to individual valuation assignments.

According to the text written within VPGA 8 potential or actual constraints on the enjoyment and use of property caused by sustainability and ESG factors may result from:

- natural causes (such as flooding, severe storms and wildfires),
- non-natural causes (such as contamination)
- or sometimes from a combination of the two.

It is stated that valuers may not have the specialist knowledge and experience required, and that in appropriate cases, valuers may recommend making further enquiries and/or obtaining further specialist or expert advice in respect of sustainability and ESG matters.

It is also stressed out that the key question is always the extent to which the factors identified affect value.

The most important notes from VPGA 8 referring to energy efficiency and sustainability:

- *context sustainability encompasses a wide range of physical, social, environmental, and economic factors that can affect value and of which valuers should be aware*
- *Sustainability matters can impact occupier preferences and purchaser behaviour, and may also be a consideration for investors, secured lenders, insurers, and public bodies.*

- *Valuers should be aware of sustainability features and the implications these could have on property values in the short, medium, and longer term. The issues may extend to:*
  - sustainability and ESG matters (see above) including, where applicable, climate change and
  - resilience to climate change
  - configuration and design including use of materials and concepts increasingly associated with 'wellness'
  - accessibility and adaptability, including access and use by those with disabilities
  - carbon emissions, energy efficiency, building 'intelligence' and other 'costs in use'
  - fiscal considerations.
- *Valuers should identify and collect sustainability and ESG-related data.*

Regarding Sustainability and ESG, RICS published in December 2021 specific guidelines targeted to commercial property valuation, applicable from 31st January 2022: "*Sustainability and ESG in commercial property valuation and strategic advice*", 3rd edition, RICS guidance note, Global, December 2021.

This global guidance note provides a practical framework for delivering on sustainability and ESG investigation, and reporting requirements in professional valuation advice. It gives:

- Good practice advice supporting everyday commercial valuation practice and its interface with ESG and sustainability.
- Alignment of ESG and sustainability considerations with the core mechanics of valuation (purpose, basis, approach).
- A glossary of globally relevant sustainability and ESG terms and an appendix referencing world-leading rating, benchmarking and performance frameworks and tools.

1.2.4 National regulations and standards

Table 2 provides list of regulations in the field of real estate valuation valid in each EUB Superhub partner country.

Table 2: List of regulations in the field of real estate valuation in the EUB SuperHub partner countries

Partner countries	National regulations and standards for property valuations in original language	National regulations and standards for property valuations translated into English
Germany	Immobilienwertermittlungsverordnung (ImmoWertV 2021)	Real Estate Valuation Ordinance 2021
Italy	Prassi di Riferimento UNI/PdR 53 - 2019: "Analisi del mercato immobiliare – Linee guida per l'individuazione del segmento di mercato e per la rilevazione dei dati immobiliari ".	UNI Pre-Standard/PdR 53 - 2019: "Real estate market analysis - Guidelines for identifying the market segment and collecting real estate data" .
	Decreto Legislativo 21 aprile 2016, n. 72, che aggiorna il Decreto Legislativo 30 settembre 1993, n. 385	Legislative Decree 21 April 2016, n. 72 updating Legislative Decree 30 September 1993, n. 385
	Prassi di Riferimento UNI/PdR 19 – 2016: Raccomandazioni per la valutazione di conformità di parte terza accreditata ai requisiti definiti nella norma UNI 11558 "Valutatore immobiliare - Requisiti di conoscenza, abilità e competenza"	UNI Pre-Standard/PdR 19 - 2016: Recommendations for third party assessment of the requirements defined in the UNI Standard 11558 "Real estate appraiser. Requirements for knowledge, skills and competence"
	Norma UNI 11612-2015: Stima del valore di mercato degli immobili	UNI Standard 11612-2015: Determination of the market value of properties
	Norma UNI 11558 - 2014: Requisiti di conoscenza, abilità e competenza del valutatore immobiliare.	UNI Standard 11558 - 2014: Requirements of knowledge, skills, and competence of the real estate appraiser"
Austria	Liegenschaftsbewertungsgesetz (LBG)	Property Valuation Act
	ÖNORM B 1802: Liegenschaftsbewertung	OENORM B 1802: Real Estate Valuation
France	Décret n° 90-941 (5/11/1990) concernant les sociétés d'assurance	Decret n° 90-941 (Nov. 5, 1990) for insurance companies
	Loi n° 93-6 du 4/01/1993 concernant les SCPI (Sociétés Civiles de Placement Immobilier)	Law 93-6 (Jan. 4th, 1993) for SCPIs
	Notice ACPR (Nov. 2021)	ACPR note (Nov. 2021)
	RICS – France National Supplément (Nov. 2021)	RICS – France National Supplement (Nov. 2021)
	Charte de l'Expertise en Evaluation Immobilière (2017)	Charter of Real Estate Valuation (2017)
Ireland	The principal legislation governing the valuation of property for rating purposes in Ireland is the Valuation Act 2001. This Act has been amended a number of times since it came into effect.	Valuation Act 2001 (No. 13 of 2001) Valuation (Amendment) Act 2015 (No. 10 of 2015) Local Government (Business Improvement Districts) Act 2006 (No. 42 of 2006) Local Government Reform Act 2014 (No. 1 of 2014)

Partner countries	National regulations and standards for property valuations in original language	National regulations and standards for property valuations translated into English
		Health Services Executive (Financial Matters) Act 2014 (No. 17 of 2014) Water Services Act 2014 (No. 44 of 2014) Courts Act 2016 (No. 22 of 2016) Water Services Act 2017 (No. 29 of 2017) Local Government Rates and Other Matters Act 2019 (No. 24 of 2019) Landlord and Tenant (Ground Rents) (Amendment) Act 2019 (No. 42 of 2019) Residential Tenancies and Valuation Act 2020 (No. 7 of 2020)
Croatia	Zakon o procjeni vrijednosti nekretnina (NN 78/2015)	Real estate valuation act (Official Gazette 78/2015)
	Pravilnik o metodama procjene vrijednosti nekretnina (NN 79/2014)	Ordinance on real estate valuation methods (Official Gazette No 79/2014)
	Pravilnik o informacijskom sustavu tržišta nekretnina (NN 68/2020)	Ordinance on the real estate market information system (Official Gazette No 68/2020)
	Uredba o masovnoj procjeni vrijednosti nekretnina (NN 28/2019)	Regulation on mass real estate appraisal (Official Gazette No 28/2019)

The brief descriptions of regulations valid in each EUB SuperHub partner country is given as follows.

1.2.4.1 Germany

The Real Estate Valuation Ordinance (ImmoWertV) regulate the valuation of real-estate properties in Germany. In its latest recast, ImmoWertV 2021, the new law incorporated the previously scattered real estate valuation regulations into a single, comprehensive, and updated ordinance. The ImmoWertV2021 is used wherever the market value of real estate is to be determined. It is therefore widely used by expert committees, appraisers, real estate agents, banks, and insurance companies for determining the property value. In relation to the scope of this document, it is important to note that the ImmoWertV 2021 ordinance recognised the impact of sustainability related building aspects such as the energetic quality of the building and its accessibility (barrier free) on the value of the real-estate and made it part of the building features that is to be incorporated in the valuation of a property.

The ImmoWertV 2021 ordinance is composed of three main sections: The first section discusses the scope of the ordinance and definition of used terms.

The second part outlines the necessary data to be collected for real estate evaluation and standard land reference value that used to determine the property tax. The property reference value represents the average value for properties, which is essentially equal in conditions of land use, type, and value.

The standard property reference value is determined locally for each federal state by responsible local land value expert committees (Gutachterausschüsse). The expert committees (Gutachterausschüsse) also identify so-called standard land value zones in which a specific standard land value applies, and which are similar in terms of use and value. The expert committees were introduced in Germany after the end of the real-estate price freeze after World War II and the introduction of the Federal Building Act (BBauG) in 1960. The task of the expert committees is to ensure transparency on the real estate market and thus counteract speculative bubbles. Due to the federal nature of Germany, there is no complete unified database for the reference property value for whole of Germany yet, but rather individual ones for each federal state. In the state of Bavaria, the reference property value is determined and published by the Bavarian expert committee for land values (Gutachterausschüsse) at the property value information system (BORIS BAYERN). The portal use is made available against a fee. A user can choose between a permanent subscription (corresponds to purchasing the entire land value card) or case by case subscription for individual information. Furthermore, the portal provides, if available, real estate market reports from the expert committees that can also be purchased.

The third and last part of the ordinance outline the real-estate valuation procedure which is to be discussed in more details in subchapter 1.3.1.

1.2.4.2 Italy

In Italy the determination of the market value of properties is guided by the UNI 11612 Standard, dated 2015. It introduces the three internationally recognised approaches (market comparison approach, income approach, cost approach) describing in detail functional principles and procedures.

The UNI 11612 Standard refers to international and European Standards as well as to two key documents representing the contextualization at the Italian level:

- the "Italian Property Valuation Standard" issued by Tecnoborsa (Organization of the Chambers of Commerce for the development and regulation of the Italian Real Estate Market),
- the "Guidelines for the properties appraisal as collateral for credit exposures " issued by ABI (Italian Banking Association).

The UNI 11612 Standard considers, only and exclusively, the market value of buildings, explicitly excluding all the bases of value other than this. The definition of market value, as derived from Regulation (EU) no. 575/2013 of the European Parliament and of the Council, dated 26 June 2013, states that the market value is "the estimated amount at which a property would be sold on the valuation date in a transaction carried out between a seller and a buyer consenting to normal market conditions after adequate commercial promotion, within which the parties have acted with full knowledge of the facts, with prudence and without any constraint ".

Already in 2014, the UNI 11558 Standard was issued to define the requirements of the real estate appraiser, in terms of knowledge, skills and competence.

The requirements for the real estate appraisers established by the UNI 1558 Standard are:

- experience of at least three years in the real estate sector,

- secondary school diploma or degree,
- knowledge of economics, appraisal, law, financial mathematics, land registry, urban planning, energy efficiency, statics and mechanics of structures, land registry and statistics,
- ability to write the appraisal report, ability to search for parameters and analysis of market development processes according to known scientific methods.

In 2018, a Circular from Accredia (Italian Accreditation Body) introduced as a further requirement the compulsory registration to proper Professional Chamber.

To provide applicative indications concerning the UNI 11558 Standard, the UNI Pre-Standard/PdR 19 "Recommendations for third party assessment of the requirements defined in the UNI Standard 11558 was issued in 2016. The document provides the basic elements for the transparency and uniformity of the assessment and certification processes managed by certification bodies accredited in compliance with UNI CEI EN ISO / IEC 17024. It highlights and describes in detail operational aspects of the certification process for the real estate appraiser (examination, maintenance, and renewal procedures).

Professionals who possess the requisites required by UNI 11558 Standard take an exam to obtain a formal certificate. Two levels of certification are provided: basic and advanced. The certificate has a duration of 6 years. Every three years, the certified appraiser must have achieved at least 60 training credits. At the end of the 6-year period, the certification is renewed only if the professional has carried out at least three appraisals, consistent with the level of certification.

In 2016, the EU Directive 2014/17/EU2 on real estate credit to consumers, was transposed into national law by Legislative Decree 21 April 2016, n. 72, which introduced, among others, in the Legislative Decree 30 September 1993, n. 385, (Consolidated Banking Act), art. 120-duodecies (evaluation of real estate). The implementation of this article governs, among others: (i) the role of corporate bodies and corporate control functions in defining the policies and processes for carrying out the property valuation activity; (ii) requirements of professionalism and independence of the real estate appraiser; (iii) entrusting the property valuation to external experts; (iv) criteria relating to the performance of the property valuation activity.

Finally, a pre-Standard (UNI PdR 53) was issued in 2019 aimed at providing real estate appraisers and, more generally, stakeholders in the sector, with a methodology for surveying and analysing the real estate market that allows them to achieve objectives of completeness, accuracy and truthfulness of the data collected. It has a dual purpose: to support the development of market indices and to establish a basis for data collecting and analysis in the context of urban planning and urban regeneration programs.

In this last UNI PdR 53 pre-Standard, dated 2019, among the various parameters that are required to characterise and assign a value to the building, the energy class and the energy performance index has been included.

1.2.4.3 Austria

In Austria, the Real Estate Valuation Act (Liegenschaftsbewertungsgesetz - LBG) is a federal law used for the legal valuation of real estate property. The methods of the legal framework represent the state of the technology. The LBG is only obligatory in judicial proceedings (e.g., expropriation proceedings), however it is also widely used for various purposes.

In addition to the LBG, the *OENORM B 1802: Real Estate Valuation* is a tool to ensure the quality of real estate valuation. It includes some basic rules and definitions of terms, influencing variables as well as well as some closer descriptions of the most common valuation approaches (market approach, value approach, income approach, discounted-cash flow approach, DCF approach). The initial intend of the OENORM B 1802 is on the one hand to give expert a guideline and on the other to improve the comprehensibility of the expert's valuation for the clients.

Since most of the used values are based on either experience or on generally valid data, energy efficiency and green features of the validated building are rarely included in real estate valuations.

1.2.4.4 France

The professional practice of valuers in France is only partially regulated.

Legislation and regulation exist for certain types of valuers and organisations or companies for which the real estate valuation is done.

Only professional practice of judiciary experts/valuers, and land, agriculture and forestry experts/valuers are recognised by French official Authorities.

The first legislative framework is dated 1990, for certain types of organisations:

- The Decree n° 90-941 of November 5th, 1990, concerns the assets located on the territories of OECD members, owned by insurance companies. It requires a quinquennial valuation and an annual update of the assets. The valuer must have his/her candidature validated by the "Autorité de Contrôle Prudentiel et de Résolution" (ACPR).
- The Law n° 70-1300 of dec. 31st, 1970 (modified by the Law n° 93-6 of January 4th, 1993), includes similar measures for "Sociétés Civiles de Placement Immobilier" (SCPI). For each building, a quinquennial valuation has to be done, updated each year by the valuer. For SCPI valuation, the expert must be recognised by the "Autorité des Marchés Financiers" AMF, authority of financial markets. There is no AMF agreement for valuers.

In these cases, the valuers have several obligations: to have sufficient competence and capacity, to be independent from the client and client's assets, to adhere to professional standards, to apply ethic principles, and not to carry out 2 successive valuations of the same asset.

Valuations for certain specific purposes or organisations are currently subject to regulation. These are the following (see "the Charter" for details, see below):

- insurance companies, mutual insurance companies and retirement benefit institutions
- specific special purpose vehicles (SPVs): Société Civile de Placement Immobilier (SCPI), Organisme de Placement Collectif en Immobilier (OPCI) or other alternative investment funds (AIFs) governed by the AIFM Directive

- valuations for publicly listed companies
- valuations for residential property mortgages
- public entities
- expropriation in the public interest
- taxation

Each item of this list has its own legislative and regulation reference articles.

It should be noted that, for the insurance companies and retirement institutions, the obligation for real estate valuers to be accepted by ACPR was recently suppressed (according to the ACPR Instruction n° 2021-I-14 of October 15th, 2021, replacing the Instruction n° 2017-I-09 of June 15th, 2017).

Since that change, a APCR note (Notice APCR, November 2021) specifies the valuation principles for buildings and parts of buildings:

- frequency of valuation of real estate assets,
- conditions of practice of valuers for real estate valuation,
- market value of real estate assets and valuation methods (two methods have to be used for each asset: Market approach and Income approach),
- valuation reports.

The valuation of investment properties owned through funds or listed companies (e.g., SIICs) is regulated by the AMF whose rules state, for example, the basis of value to be adopted, the requirements for independent valuers and the need for periodic rotation of valuers.

The valuation of property owned by its occupiers usually follows French accounting principles, and sometimes International Financial Reporting Standards (IFRS) if applicable. There are special rules for valuations for residential mortgage purposes.

Regarding qualification requirements, real estate valuers are not subject to statutory regulation in France. However, there are several well-established French professional organisations representing valuers, including RICS, which regulate their members in accordance with their own professional standards.

Regarding **valuation standards in France**, we have the following two important documents:

- The France national supplement to the RICS Valuation Global Standards (Red Book), published in November 2021, effective since that date,
- The “Charte de l’Expertise en Evaluation Immobilière” (called here “the Charter” or CEEI), 5th edition, 2017. The Charter is co-signed by 15 French associations representing real estate valuation experts, including RICS.

<u>RICS - France national supplement:</u>

In the hierarchy of texts, RICS recognises the high-level valuation principles and definitions, now included in the IVS, published by the IVSC. More generally, The Red Book formally recognises and adopts the latest IVS, therefore requires its members to follow them.

The purpose of this national supplement is to assist valuers who are members of RICS in ensuring that a valuation undertaken in accordance with RICS Valuation Global Standards is also compliant with the French national valuation standard, the “Charte de l’Expertise en Evaluation Immobilière” (the Charter), and other relevant

French legislation. Of course, all members who are RICS Registered Valuers are obliged to follow Red Book Global Standards as the primary valuation standard.

This document describes French background (applicable regulation), national professional and valuation standards (mandatory), a summary of "the Charter" and

"The Charter", Charte de l'Expertise en Evaluation Immobilière:

"The Charter", written in French, is the recognised national standard for property valuation in France. It defines the roles and duties of valuers in France and outlines technical and regulatory aspects. Its application is mandatory for members of associations who are signatories to the Charter. The Charter is co-signed by 15 French associations representing real estate valuation experts. RICS is a co-signatory and a member of the Charter application committee. Among signatories, there is the CSN, the High Council of Notaries.

RICS says that the contents of the Charter differ from that of Red Book Global Standards on certain points, but there are no major differences that make Red Book Global Standards incompatible with the Charter.

The structure of the Charter is the following:

- Part I: General conditions of valuation practice
- Part II: Valuation methodologies
- Part III: Assignments and due diligence
- Part IV: Effect of technical standards and **sustainable development** on the expert
- property valuation process
- Annexes (7)

Part IV provides guidance on sustainable development, including environmental certification, labels and data, and its impact on the assessment of values. There is no equivalent reference in Red Book Global Standards, but guidance is provided in the latest edition of Sustainability and ESG in commercial property valuation, RICS guidance note, dec. 2021 (applicable January 31st, 2022). Valuers are encouraged to be trained to sustainable development issues and related building characteristics, and to consider sustainable performance in their valuation.

The Annex 6 of the Charter is a rating template for office buildings, dated May 2015, validated the same year by RICS, ORIE (regional observatory of commercial real estate), ADI (real estate directors association) and AFREXIM (French association of real estate valuers' companies). The rating comprises three groups of points, totalising 120 or 135 points (according to the building size). The third group deals with "regulatory aspects and sustainable development", for 27 points at a maximum.

In this third group, it is interesting to note that:

- The **EPC class** counts from 0 to 4 points,
- The building thermal regulation and **environmental certifications and labels** (like HQE, BREEAM, LEED or others recognised ones) can offer up to 12 points (no more details are given),
- Issues like water or waste management, acoustics, biodiversity, and renewable energy can offer up to 7 points.

1.2.4.5 Ireland

Real estate valuation legislation in Ireland is overseen by the Valuation Office, the functions of which are principally set out in the Valuation Act 2001. This act encompasses the principal legislation governing the valuation of property for rating purposes within the country. It has been amended several times since it first came into effect.

The Law Reform Commission prepared the administrative consolidation of legislation governing the Valuation Office and is responsible for updating the administrative consolidation any time a change is made to the legislation. A number of other individual Acts relating to real estate valuation legislation include:

- Valuation Act 2001 (No. 13 of 2001)
- Valuation (Amendment) Act 2015 (No. 10 of 2015)
- Local Government (Business Improvement Districts) Act 2006 (No. 42 of 2006)
- Local Government Reform Act 2014 (No. 1 of 2014)
- Health Services Executive (Financial Matters) Act 2014 (No. 17 of 2014)
- Water Services Act 2014 (No. 44 of 2014)
- Courts Act 2016 (No. 22 of 2016)
- Water Services Act 2017 (No. 29 of 2017)
- Local Government Rates and Other Matters Act 2019 (No. 24 of 2019)
- Landlord and Tenant (Ground Rents) (Amendment) Act 2019 (No. 42 of 2019)
- Residential Tenancies and Valuation Act 2020 (No. 7 of 2020)

A number of Statutory Instruments (SIs) have also been put in place following the enactment of the Valuation (Amendment) Act 2015, including fees regulations, occupier assisted valuation regulations, prescribed means for certificates, notices and other regulations and global valuations and rates limitation orders.

1.2.4.6 Croatia

Real estate valuation in Croatia is regulated by the Real Estate Valuation Act (Official Gazette No 78/2015) and is performed only by authorised persons who are permanent court expert witnesses and permanent court valuers. The Real Estate Valuation Act prescribes three main real property valuation methods: sales comparison, income approach and cost approach. It is noteworthy that in the whole Real Estate Valuation Act in Croatia the term energy efficiency is not mentioned at all.

Based on transactions, real property purchase prices are collected and maintained by the Taxation Authority of the Ministry of Finance. Records are stored in the real estate information system 'eNekretnine' (https://nekretnine.mgipu.hr/) which enables authorised valuers and real estate brokers to access data which is the basis for their quality professional work. This database is important to ensure the transparency of the real estate market and contains data on the number of transactions for each area, on the types of real estate and data on real estate that was the subject of the transaction - apartment, single family house, office premises, agricultural, construction, forest land, prices achieved, etc. The property market information system allows certified court valuers, agents in property transactions and local and regional self-government units to access the data on property

transactions. The responsible institution for the real estate information system 'eNekretnine' is the Ministry of physical planning, construction, and state assets. One of the key data for database management is the data on the location of the property, i.e., the achieved price of property. The main problem with the real estate information system 'eNekretnine' in Croatia is **the lack of connection between the energy efficiency rating and the achieved price of property**. Energy efficiency rating or any other data related to the energy efficiency of a building are not stated within this database.

The real estate information system 'eNekretnine' is used only by authorised parties (court valuers, agents in property transactions and local and regional self-government units) and its intended use is individual property valuation.

Ordinance on real estate valuation methods (Official Gazette No 79/2014) elaborates three methods of real estate valuation (sales comparison, income approach and cost approach) and other issues related to it. The aim of this Ordinance is to determine the market value of real estate according to unique methods and procedures.

Ordinance on the real estate market information system (Official Gazette No 68/2020) prescribes the content and manner of managing real estate information system, the collection of purchase prices and the value plan, and the manner of using data from the same.

Every year the Institute of Economics from Zagreb publishes an overview of the real estate market of the Republic of Croatia. The last one overview published refers to year 2020. The main goal of the publication is to make basic information regarding the state and trends on the real estate market in Croatia publicly available to enable a more effective management of Croatian real estate and a more efficient and rational management of the Croatian territory. The overview of the real estate market in Croatia focuses on the existing conditions and trends on the real estate market. It thereby differentiates between several types of real estate properties: apartments (including apartments built for tourist accommodation), family houses, business properties, construction properties, agricultural properties, and forest land. The data presentation emphasises the average (median) purchase prices of real estate, the average size of the real estate, and the average age of the real estate (in case of residential properties). Data are provided for each type of real estate and each type of indicator on a national level, county level, the level of local self-government units, and the level of cadastral municipalities for the City of Zagreb.

1.3 Valuation approaches

Nowadays the following three standard valuation approaches for property valuation exist:

- **market approach** (or comparative method, market sales comparison approach),
- **income approach**,
- **cost approach**.

The most common approach and preferred approach used for price valuation of residential properties is the market approach, whereas the income and cost approaches are rarely used in the valuation of residential properties.

The market approach provides an indication of value by comparing the subject asset with identical or similar assets (as similar as possible) that have been recently sold and for which price information is available. Prices of sold properties must be gathered in comprehensive database. With statistical methods such as the multiple regression analysis, specific adjustment factors can be derived.

The income approach is often used where ownership and occupation are separate in the case of so-called income property, which is defined as a real estate developed or purchased to produce income (e.g., in a rental unit tenant pays rent to a landlord and also running costs to utility companies and small decorative repairs, whereas a landlord receives an income from renting an apartment and pays operating costs such as management, maintenance, repair…). This approach provides an indication of value by converting future cash flows (rent) to a single current capital value.

Three sub-methods exist within income approach:

- the direct capitalization method,
- the income multiplier method,
- DCF (discounted-cash flow) method.

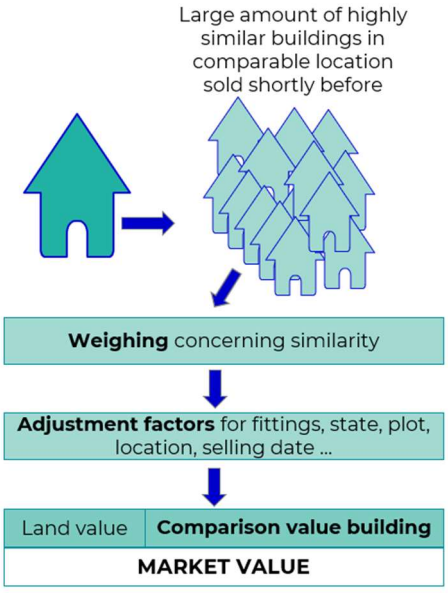

Figure 5: Market approach

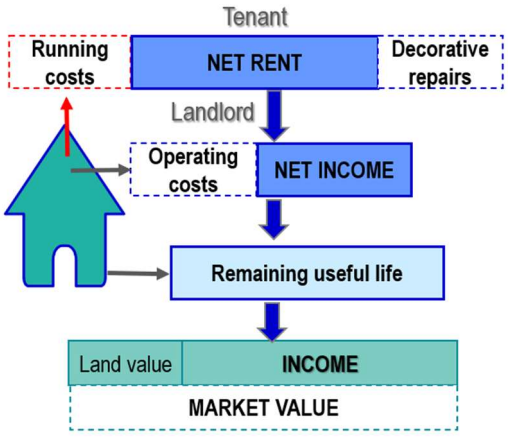

Figure 6: Income approach

And the last approach called cost approach is the least preferred approach mainly used for buildings, where no comparable sold buildings are available and whose main purpose is not to generate income. The cost approach is based on cost of providing a similar equivalent alternative. This approach is sometimes used as a supportive method to check one method against the other.

In the case of cost approach, there are two sub-methods:

- the depreciated replacement cost method,
- the residual method.

The 'Depreciated Replacement Cost Method' is usually used in valuing non-profit public properties (e.g., village halls, schools), where there are no comparable sold similar properties, as they are not traded on the open market. Valuation is based on the cost of providing a similar/ equivalent alternative.

Figure 7 shows a simple flow chart demonstrating the choice of valuation approach.

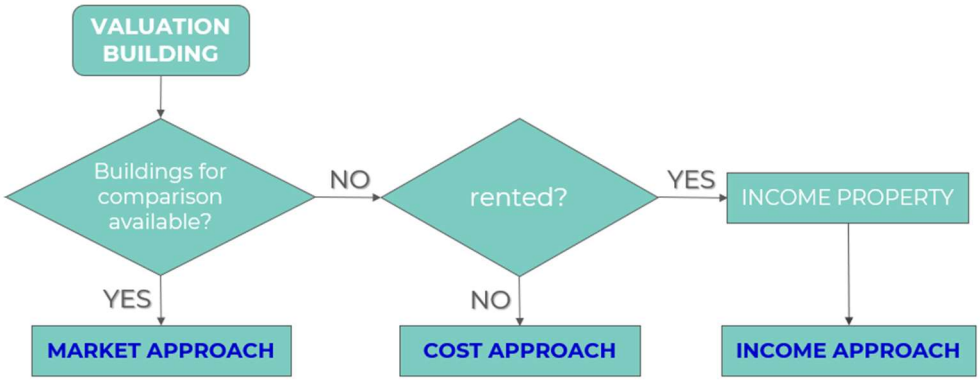

Figure 7: Simple flow chart demonstrating the choice of valuation approach

1.3.1 Germany

For the valuation of real-estate in Germany, the ImmoWertV 2021 ordinance allow for the use of one of the common three real estate valuation approaches: the comparative value method or the market approach (Vergleichswertverfahren), the income approach (Ertragswertverfahren) and the cost approach (Sachwertverfahren).

In market approach, the value of the property is calculated based on the value of comparable objects. If this cannot be guaranteed, for example because the area is sparsely populated, a similar object from a comparable area can also be used. The comparative value method can be used for developed and undeveloped land. The following applies: the more similar the objects, the more precisely the comparison value can be determined.

However, since the comparison value method uses historical and sometimes outdated values, it does not correspond to the current real market value in most cases. Therefore, index series or conversion coefficients are used, so that the initial comparison value is adjusted to the current value of the property.

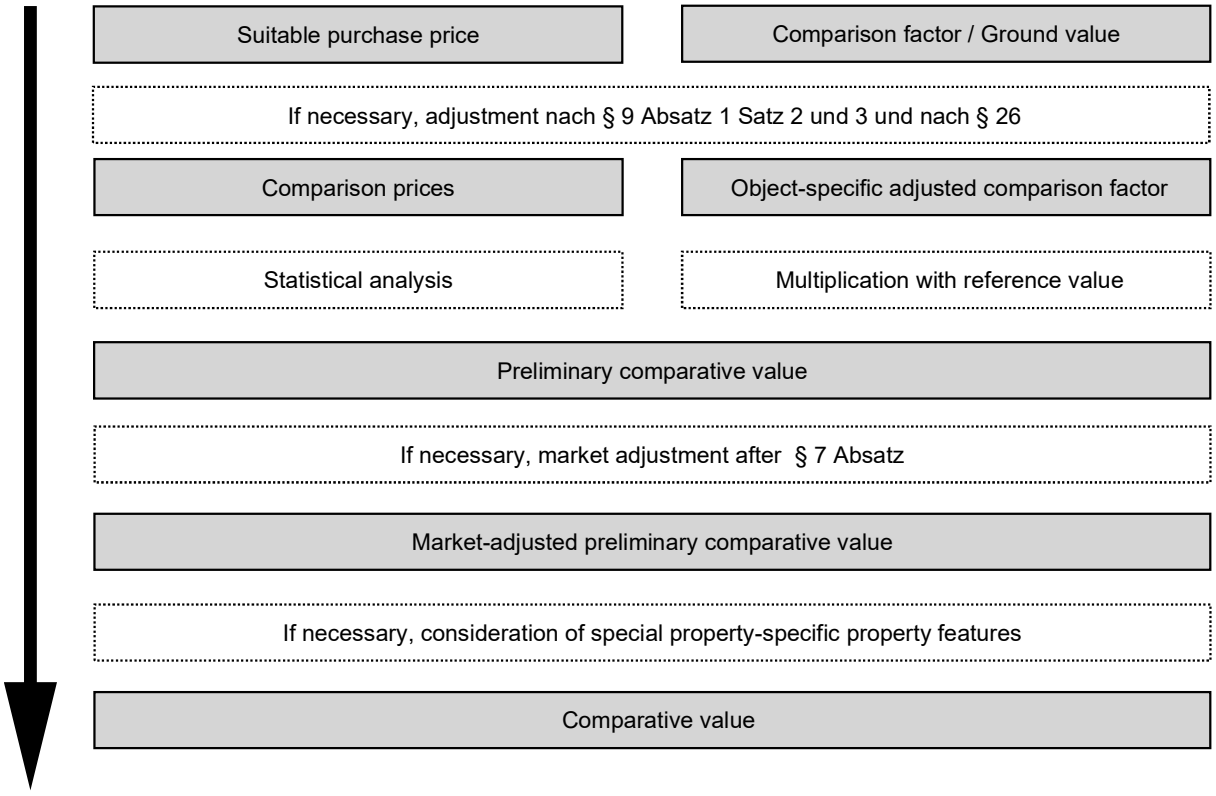

Figure 8: Steps for real estate valuation via the Market approach as per the ImmoWertV 2021

The second method for real estate valuation is the discounted earnings method or the income approach. The calculation basis here is the land value and the yield value income such from the built improvements as rent of house and lease of land. When determining the earnings value, the land value, the interest on the land value and the capitalised net income are considered. Here, the land value is reduced by the land value interest amount. The next step is to determine the net income. This

subsumes the annual gross income such as rent or lease. The management costs are then deducted from this gross income, so that the result is net income.

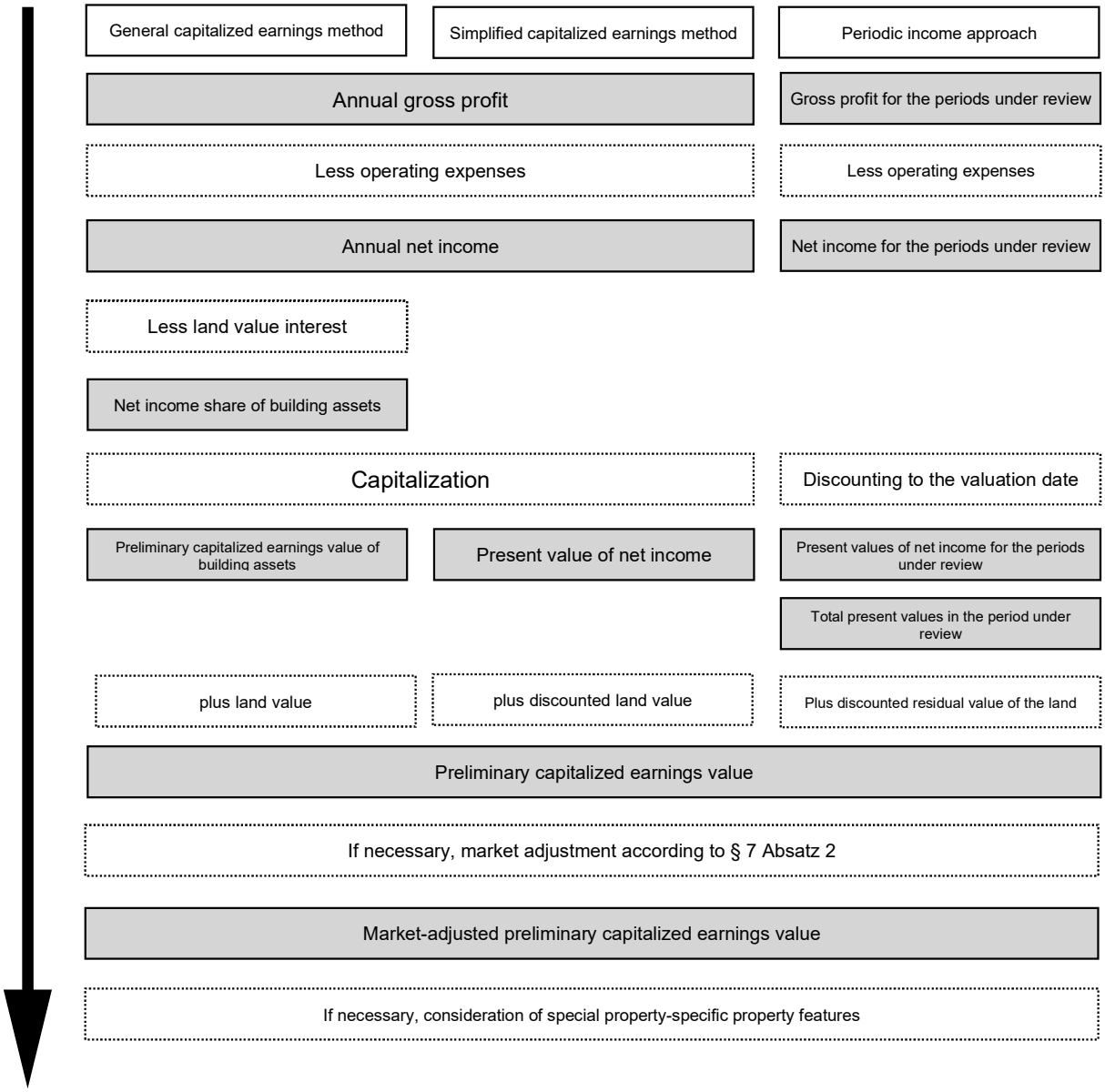

Figure 9: Steps for real estate valuation via the income approach as per the ImmoWertV 2021

As per the ImmoWertV 2021, the real estate valuation can also be carried out using the cost method. The Real Estate Valuation Ordinance sets the following formula: real-estate value(cost)= building cost + land value * market adjustment factor (value ratios on the real estate market). According to ImmoWertV, the value ratios on the real estate market are regulated by the material value factors.

In the cost approach, the value of a property reflects the construction costs of the building and its age depreciation. The reduction in age is calculated considering the ratio of the remaining useful life to the total useful life of the building. To determine the land value, the standard land values of the municipalities are compared, which here refer to an undeveloped property.

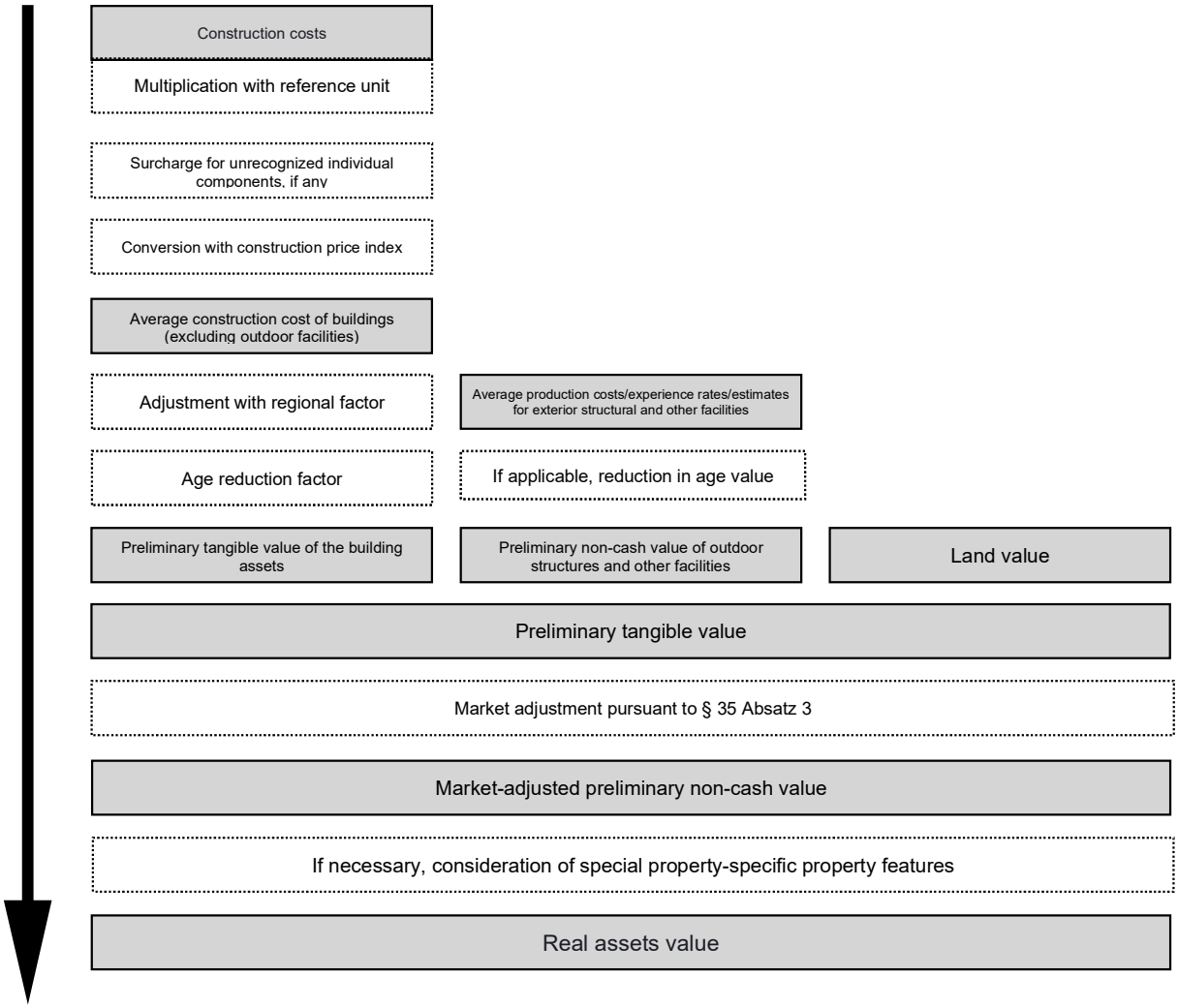

Figure 10: Steps for real estate valuation via the cost approach as per the ImmoWertV 2021

1.3.2 Italy

In Italy the real estate valuation is in line with the three international standard approaches described above:

- market comparison approach,
- income approach,
- cost approach.

They were introduced and detailed by the UNI 11612 Standard, dated 2015.

The assumption behind a correct and reliable real estate valuation is the availability and transparency of information on the characteristics of the property. This information concerns various areas:

- juridical-urban planning (property rights, constraints, mortgages, urban planning regulations, etc.),
- technical (functionality of the building systems, state of maintenance, energy efficiency, etc.),
- economic (market in which the building is inserted, purchase and sale prices of similar goods, income deriving from the ownership of similar goods, yields).

The availability and reliability of such data is considered crucial and, in this sense, the UNI PdR 53 pre-Standard, dated 2019, provides guidelines on the appropriate methodology for the detection of estimative parameters in relation to the market segment and the technical-economic characteristics of the properties.

The Real Estate Market Observatory of the Italian Revenue Agency carries out statistical surveys and studies related to the residential and non-residential real estate market, based on a large number of data collected at national level.

Furthermore, starting from January 2004, the Revenue Agency of the Italian Ministry of Economy and Finance, made available the Database of the real estate prices (https://www1.agenziaentrate.gov.it/servizi/Consultazione/ricerca.htm). It provides an estimate of the transaction value of the properties (indicating a minimum/maximum range of price) based on a set of parameters (location of the building, type of property, state of conservation, etc.). The database is updated every six months.

Multiple users can access the database:

- private citizens who ask for support in determining the right purchase price,
- technicians and professional appraisers who need a tool to support the valuation activity,
- operators and companies that manage and/or invest in real estate assets,
- credit institutions, banking groups and insurance companies.

The information relating to the energy performance class of buildings is currently not integrated into the database. These data could be taken from the Information System on Energy Performance Certificates (SIAPE) managed by ENEA which collects and centralises in a single database the Energy Performance Certificates of buildings and real estate units present in the registers of Regions and Autonomous Provinces (currently 15 out of potential 21). The EPC (in Italy called APE) must be, under current legislation, attached to the sale and rental contract for any kind of real estate, with some exceptions, and sent to the competent Region.

Regarding the specific issue of relating the market value of a building to its energy efficiency, in November 2020, ABI (Italian Banking Association) published the technical appendix entitled "*Preliminary methodological indications on how to evaluate energy efficiency and seismic qualification of buildings in terms of market value*"

The document starts from the consideration that at present in Italy, mainly for cultural reasons, real estate market demand from households and micro-enterprises is rarely able to measure the benefits produced by increased energy efficiency and therefore is not always able to attribute greater value to real estate property with higher performing energy characteristics. On the other hand, however, financial institutions and insurance companies are more attentive and aware of the importance of the sustainability of the property value over a long period from the point of view of the Long-Term Sustainable Value (UNECE 2019, Policy Framework for Sustainable Real Estate Markets). However, the process of acquiring greater awareness from customers is underway and more and more cultural evolution will be reflected in the dynamics and values of the market. The ABI technical document therefore provides information to the real estate appraiser useful for quantifying the increase in value of a building in relation to its energy

class. In the first instance, the evaluator must verify, preferably through the comparative method (MCA), the incidence of this characteristic on market prices using data collected from properties that have the same energy efficiency class as terms of comparison in the application of the estimative methodologies.

If, on the other hand, it is necessary to indirectly determine the impact of energy efficiency in determining the market value of a property, it is possible to do so through an estimate of the costs necessary for the transformation of the building to achieve a higher energy class.

ABI technical document provides specific calculation formulas to objectively determine the marginal price of the building's energy efficiency characteristics.

1.3.3 Austria

The real estate valuation procedures in Austria are based on the Real Estate Valuation Act (Liegenschaftsbewertungsgesetz) and related standards. They demand a real estate valuation according to the state of science:

- market comparison approach,
- income approach,
- cost approach,
- DCF approach,
- ...

Those approaches allow a consideration of the energetic quality of real estates. For example, office buildings with low operational costs, a healthy indoor climate and flexibility in the use have reduced vacancy rate and thus a lower risk of loss of rent. When valuating single-family homes, for example the thermal insulation can be considered.

The "*Leitfaden zum Umgang mit Energieeffizienz und weiteren Nachhaltigkeitsparamentern in der Immobilienwertermittlung*" (Guideline for approaching energy efficiency and other sustainability parameters in real estate valuation") gives methodological approaches for taking the energy quality of buildings – based on characteristics from the EPC - into account in the valuation of real estate.

In practice, however, the building specific information is only superficially considered. Due to limited time and maybe also the lack of relevant information, experts use generally valid characteristic. Therefore, the valuation in Austria often does not adequately reflect neither the energy efficiency nor other "green" building qualities.

1.3.4 France

The real-estate valuation procedures in France are based on the Charte de l'Expertise en Evaluation Immobilière (the national standard for real estate valuation in France). It follows the International Valuation Standards and the Royal Institution of Chartered Surveyors (RICS) Global Standards (The Red Book). The fifth edition (2017) "*defines the roles and duties of valuers in France and outlines technical and regulatory aspects. Its application is mandatory for members of associations who are signatories to the Charter.*" (RICS, 2021).

As in the other countries, the real estate valuation defined by the Charter is in line with the three international standard valuation approaches described above (section 1.3):

- The market approach (Comparable transactions method) measures the value of an asset by comparing recent sales carried out on the real estate market for properties with similar characteristics and comparable location. Several evidence can be used as units of comparison. The price per square meter, the rent per square meter, the price per room are the most frequent units selected. This approach is particularly relevant when several similar assets are actively publicly traded and when recent observable transactions concern similar assets. However, sometimes assets are either heterogeneous or transactions are limited. In this case, it is not possible to identify transactions involving similar assets. In such situation, the valuers need to indicate that this approach may not be appropriate, document the adjustments made and detail their impacts. The valuers can also select different methods and explain why these options were retained.
- The income approach is mainly based on the rent provided by the asset: With the discounted cash flow (DCF) approach, the cash flow related to the rent are forecasted over a period. The value will be discounted according to the time value of money and the risk associated with the future operations of the assets.
- The cost approach is based on the replacement cost of an asset. Forecast concerning the physical deterioration and the obsolescence of the asset are deducted from the calculated value. This method is used when both the market and income approaches are not adapted.

French notaries are involved in every real estate transaction (buildings, houses, apartments, land, business premises, agricultural and wine-growing properties, garages). Thus, there were able to develop a database gathering real estate references, resulting from the acts received after the sales. Created 20 years ago, the database has about 11 million real estate references. It shows the real price of transactions. It allows the Notaries of France to publish statistics about French property prices and presenting the link between EPC and the sale value of the real estate (housing market). However, property valuers consider that too many real estate characteristics are lacking in the database to evaluate the assets by using the comparable transactions method.

1.3.5 Ireland

In Ireland all market valuations are undertaken by the Valuation Office and are carried out in accordance with the International Valuation Standards and the Royal Institution of Chartered Surveyors (RICS) Global Standards (The Red Book).

The Valuation Office provides accurate and up-to-date valuations of commercial and industrial properties to ratepayers and local authorities. The Office also provides various Government Departments, State agencies and public bodies (including third level institutions) with a valuation service. This is undertaken by the office's State Property Valuations team who carries out open market capital and rental valuations.

Properties being transferred between Government Departments, state bodies, and other local and national authorities and agencies are provided with open market valuations under the government's Accommodating Change – Measuring Success: Property Asset Management Delivery Plan 2013. This is also in accordance with the Department of Public Expenditure and Reform Circular 11/15: Protocols for the Transfer and Sharing of State Property Assets. Numerous Government Departments and statutory bodies utilise the valuation services provided by the Valuation Office, including, but not limited to, the Department of Agriculture, Food, and the Marine; Department of Housing, Planning and Local Government; Health Service Executive; Office of Public Works; Commissioners of Irish Lights; Courts Service; TUSLA and the National Sports Campus Development Authority.

Property Service Providers (PSPs) i.e., Auctioneers, Estate, Letting and Management Agents, etc. are controlled and supervised by the Property Services Regulatory Authority (PSRA) through licensing and regulating PSPs. The PSRA is also responsible for three Public Registers – the Residential Property Price Register, the Commercial Lease Register, and the Register of Licensees. The Residential Property Price Register hosts the date of sale, price and address of all residential properties purchased in the country since 1st January 2010. The Commercial Lease Register contains the address, date, term of years of the lease and rent payable in respect to commercial leases entered since 1st January 2010. The Register of Licensees can be used to locate persons legally entitled to provide property services by name, number, licence type and location.

1.3.6 Croatia

The Real Estate Valuation Act (Official Gazette No 78/2015) (https://narodne-novine.nn.hr/clanci/sluzbeni/2015_07_78_1491.html) quotes the following three methods for real estate valuation:

- comparative method (market sales comparison) (*in the Croatian language*: poredbena metoda),
- income method (*in the Croatian language*: prihodovna metoda),
- cost method (*in the Croatian language*: troškovna metoda).

The method for real estate valuation in Croatia is selected according to the type of appraised real estate. The choice of method needs to be explained in detail in the appraisal. Appraisal is a professional analysis used to estimate the value of the

property. If more than one prescribed method is used, one is basic, and the other methods are used to support and verify the results.

When making a real estate valuation assessment, the following two rules must be followed.

1. general value relations in the real estate market (market adjustment),
2. condition or quality of the real estate and special significant features of the assessed real estate.

The comparative method is applicable for real estate valuation of not built-up and built-up land, and for the property valuation of stand-alone detached single-family houses, rowhouses, apartments within multifamily residential buildings, garage parking spaces, parking spaces and business premises. The comparative method determines the market value from at least three transactions prices of comparative real estate.

The income method is primarily used for the real estate valuation of built-up cadastral parcels with build rented real estate, commercial and other real estate whose main purpose is to generate income.

The cost method is primarily used for the real estate valuation of built-up parcels with public buildings and other buildings, that are not built to generate income, and are not comparable in their characteristics (e.g., stand-alone single-family houses). The cost method is appropriate also in cases of damage assessments (financial assessment) and building failures, and in case of building renovations.

Ordinance on real estate valuation methods (Official Gazette No 79/2014) (https://narodne-novine.nn.hr/clanci/sluzbeni/2014_06_79_1475.html) elaborates in more details the three already mentioned methods of real estate valuation.

Features that influence the value of real estate in Croatia taken into account through the Ordinance on real estate valuation methods:

- land category (four land categories in Croatia),
- site features – transport connectivity, location of residential and commercial buildings and other environmental impacts,
- impact of noise and air pollution,
- predicted remaining useful life.

Data necessary for real estate valuation primarily include capitalization rates, adjustment coefficients, index series, conversion factors, and benchmarks for built-up plot.

1.4 Key findings - cross country comparison

Sustainability and energy efficiency have already been considered in the last editions of international and European standards (e.g., 9th edition of the Blue Book published by TEGoVA, the Red Book published by RICS in January 2022). The whole parts of those standards are dedicated to energy efficiency and sustainability. Within the Blue Book the general checklist is given when addressing sustainability.

A green or sustainable building regarding the health and well-being of its users needs to:

- generate less waste (waste management),
- conserve water (water efficiency),
- optimise energy efficiency,
- provide adequate daylight and ventilation.

In the Red book is stated that valuers may not have the specialist knowledge and experience required, and that in appropriate cases, valuers may recommend making further enquiries and/or obtaining further specialist or expert advice in respect of sustainability matters. Valuers should be aware of a wide range of factors (social, environmental, and economic) encompassed by sustainability that can affect value of a building.

In some national standards across the project partner countries involved in this task sustainability is also acknowledged (e.g., ImmoWertV 2021 in Germany). Also, "Guideline for approaching energy efficiency and other sustainability parameters in real estate valuation" in Austria gives methodological approaches for taking the energy quality of buildings (based on characteristics from the EPC) into account in the real estate valuation. Due to limited time and maybe also the lack of relevant information, experts use generally valid characteristic. Therefore, the valuation in Austria often does not adequately reflect neither the energy efficiency nor other "green" building qualities.

On the other hand, in the Real Estate Valuation Act (Official Gazette No 78/2015) in Croatia the sustainability and energy efficiency matters have not been considered yet at all. Although the real estate information system 'eNekretnine' is in place in Croatia containing the achieved price of a property, there is still no indication of the energy class of a building.

All project partner countries use one of the three main standard valuation approaches for property valuation.

Table 3 gives overview of national property price registers containing transaction values of sold properties across project partner countries.

Due to the federal nature of Germany, there is no complete unified database at the national level for the reference property value yet, but rather individual ones for each federal state. Data collected for those individual databases for the reference property value hosts the date of sale, and price but also the whole set of detailed data related to energy efficiency, which are collected through a questionnaire, that need to be filled out by the new owner of the property. Filling out that questionnaire is mandatory in Germany, and it is regulated by law (§ 197 Baugesetzbuch). Those questionnaires vary in their design and slightly in their

content across Germany, sometimes they are not even the same in the same federal state.

Although the EPC label is not indicated in those questionnaires, all analysed questionnaires (Rosenheim, Aichach, Kiel, Leonberg) for the purposes of this task give a very useful description of the main building elements:

- external walls,
- roof,
- windows and outer doors (type of glazing),
- internal walls and internal doors,
- deck construction,
- floors,
- sanitary facilities,
- heating system (heat source type).

Since January 2004 the Database of the real estate prices is in place in Italy providing transaction prices but also rental prices for residential, commercial and office buildings. The database does not contain an EPC label of a building being sold or rented or any other data related to energy efficiency. Alongside providing transaction prices/rents of buildings being sold or rented, the database provides data related to the state of conservation and the maintenance of the technical building system.

There is neither a property price register nor a lease register in Austria.

In France, the notaries play an important role in feeding national databases of transaction prices. As they manage land and real estate transactions, they transfer to databases summary information. They feed BIEN database for Paris and the Parisian area, and PERVAL database for the rest of France. With these information datasets, notaries have identified a clearer link between the building value and the EPC class (expressed as premium or discount percentage compared to D class), for individual houses and apartments, in the various French regions, less visible in large cities where the real estate market is stressed. See the notaries publications and maps in the literature state of the art chapter.

With the information transferred by notaries, the French state (general directorate of public finances) launched in 2019 an open-access database (accessible by everybody), using the file called “DVF”, provided by Etalab. The objective is to contribute to the transparency of real estate and land transactions. It is very detailed, giving the transaction prices plot of land by plot of land, with a very good GIS system, for all the transactions carried out the 5 last years (2022 not yet available). It covers all France, excepted Mayotte, Alsace, and Moselle.

Are documented there the prices of (empty) plots of land, residential units or entire buildings, commercial/industrial units, or entire buildings. The granulometry is very small (plot scale) but the information on each plot of land is not very detailed: transaction price, date of transaction, address, surface, type of asset (house, apartment, number of main rooms, but no detail on commercial/industrial assets), possible dependences (with no detail if it is a cellar, a garage or other), ground surface if any. There is no information on energy nor EPC class, it is a pity because notaries give this information! In 2019 this tool was not well-known by the public, but today it is a very valuable source of information, both for the public and for the

professionals (real estate agents for instance). If somebody wants to know how much his neighbour sold his house last year, it is possible.

The web address is: https://app.dvf.etalab.gouv.fr/

Another web tool is interesting to mention, it is the "Observatoire Régional du Foncier en Ile-de-France", ORF, regional observatory of land property for the Parisian area. This tool included a cartography at the scale of the municipalities, and the number, volume and median price of transactions is given. It is possible to select categories as apartment, number of main rooms, and some other features. It is a complementary tool of the previous one, based also on the DVF file, giving statistical information.

Web link: http://www.orf.asso.fr/valeurs-foncieres/

Regarding the prices of residential rents (private sector only, excluding social housing), there exists since 2013 a national network of more than 50 local rents observatories: the "Observatoire des Loyers". They provide interesting statistical information and studies, but the initial datasets are not available for each dwelling (there are several strict exceptions). The granulometry is not very good, and the French territory is far to be totally covered, but the large cities and their suburb are present, also some medium-size ones.

Web link: https://www.observatoires-des-loyers.org

The Residential Property Price Register in Ireland at national level hosts the date of sale, price and address of all residential properties purchased in the country since January 1st, 2010.

In Croatia real property purchase prices are collected and stored in the real estate information system 'eNekretnine' at national level.

Table 4 gives overview of national leases registers (register of rent payable in respect of property) across project partner countries.

Only Italy and Ireland gather rent prices of buildings being rented. However, those databases do not include any data related to building energy efficiency (e.g., EPC label, etc.).

The Commercial Leases Register, in place in Ireland since January 1st, 2010, includes the following information:

- the Address of the Commercial Property the Subject of the Lease,
- the Date of the Lease of the Property,
- the Term of Years of the Lease,
- the Rent Payable in Respect of the Property.

It can be concluded that existing databases containing transaction values of sold properties and rent prices of rented properties do not contain EPC labels of building being sold or rented or any other data related to building energy efficiency. In project partner countries it is not possible to quantify the increase or decrease of property value linked to energy efficiency (e.g., EPC label).

Only database in Germany contains set of detailed data related to energy efficiency (description of the main building elements).

Based on the analysis conducted in this chapter it can be concluded that digitalisation is required to link property values /rent values of a building/building unit with building energy efficiency data.

Table 3: Overview of national property price registers across project partner countries

Country	Germany	Italy	Austria	France	Ireland	Croatia
PROPERTY PRICE REGISTER or REAL ESTATE INFORMATION SYSTEM (register containing transaction values of sold properties)						
Does a national property price register exist? (yes/no)	no Individual one exists for each federal state	yes	no	yes	yes	yes
Name of property price register	**Database of real estate prices**	**Database of real estate prices**	**–**	**Land property and real estate transactions prices**	**Residential Property Price Register**	**Real estate information system eNekretnine**
Name of property price register in original language	Kaufpreissammlung	Banca dati quotazioni immobiliari	–	Demande de valeurs foncières (fichier DVF)	Residential Property Price Register	Informacijski sustav tržišta nekretnina eNekretnine
Home page of property price register	See example:https://redaktion-akoga.niedersachsen.de/gutachterausschuesse/kaufpreissammlung/kaufpreissammlung-72286.html	https://www1.agenziaentrate.gov.it/servizi/Consultazione/ricerca.htm	–	https://app.dvf.etalab.gouv.fr/	https://www.propertypriceregister.ie	https://nekretnine.mgipu.hr
Name of organisation / ministry/ company responsible	Obere Gutachterausschüsse (OGA) - Higher Valuation Board	Revenue Agency - Ministry of Economy and Finance	–	French General Directorate of Public Finances (DGFiP) of the Ministry of Finances, in partnership with Etalab	Property Services Regulatory Authority	Ministry of physical planning, construction, and state assets
Type of buildings covered	Residential and non-residential buildings	Residential, commercial, offices	–	Residential and non-residential buildings, plots of land	Residential buildings	Residential and non-residential buildings
Does register contain EPC label class of a building/building unit being sold? (yes/no)	No (but contain information about the final and primary energy values)	no	–	no	no	no
Does register contain any other data related to energy efficiency of a sold building/ building unit? (yes/no)	yes	Not at the present. The parameters considered to characterise the properties in the DB include the state of conservation and maintenance of the building systems (therefore including heating / cooling systems). But there is currently no specific information on energy efficiency.	–	no	no	no

Table 4: Overview of national leases registers across project partner countries

Country	Germany	Italy	Austria	France	Ireland	Croatia
LEASES REGISTER (register of rent payable in respect of property)						
Does a national leases register exist? (yes/no)	no	Yes, it is the same database as described in Table 3	no	There exists a national network of local rents observatories	yes	no
Name of leases register	–	**Database of real estate prices**	–	**Rents observatory network**	**Commercial Leases Register**	–
Name of leases register in original language	–	Banca dati quotazioni immobiliari	–	Observatoire des Loyers – Le réseau des observatoires locaux	Commercial Leases Register	–
Home page of leases register	–	https://www1.agenziaentrate.gov.it/servizi/Consultazione/ricerca.htm	–	https://www.observatoires-des-loyers.org	https://www.propertypriceregister.ie	–
Name of organisation / ministry/ company responsible	–	Revenue Agency - Ministry of Economy and Finance	–	National Agency on Housing Information (ANIL) Various actors support local observatories, including information agencies on housing (ADIL), town-planning agencies, or the Parisian area rents observatory (OLAP)	Property Services Regulatory Authority	–
Type of buildings covered	–	Residential, commercial, offices	–	Residential (private sector, not social housing)	Commercial buildings	–
Does register contain EPC label class of a building/building unit being rented? (yes/no)	–	no	–	no	no	–
Does register contain any other data related to energy efficiency of a rented building/ building unit? (yes/no)	–	Not at the present. The parameters considered to characterise the properties in the DB include the state of conservation and maintenance of the building systems (therefore including heating / cooling systems). But there is currently no specific information on energy efficiency.	–	no	no	–

2 Review of existing literature

A literature review about the impact of energy efficiency and sustainability improvements on the value of buildings by increasing their actual value and through the impact on operational cost was one of the subtasks within Task 1.4 Impact of energy efficiency improvements and certifications on the value of buildings.

A review of existing literature identified several European projects, many articles within journals, journals at national levels, conducted research analysis and surveys on the real estate market (e.g., Italy), initiatives, reports and insight papers of various organisations dealing with real estate valuation considering energy efficiency and sustainability aspects.

It is important to stress that the literature review below focuses only on Europe.

2.1 European projects

A literature review identified several European projects entirely or partly covering real estate property valuation. Table 5 lists the European projects with basic data.

Table 5: List of European projects involved into real estate property valuation

Project acronym	Project title	Project duration	Project home page
ZEBRA2020	Nearly Zero-Energy Building Strategy 2020	04/2014 – 09/2016	https://zebra2020.eu
REVALUE	Recognising Energy Efficiency Value in Residential Buildings	01/03/2015 – 28/02/2019	https://revalue-project.eu
CA EPBD IV	Concerted Action EPBD IV	01/10/2015 – 30/09/2018	https://epbd-ca.eu/
EeMAP	Energy efficient Mortgages Action Plan	01/05/2017 – 30/04/2019	https://energyefficientmortgages.eu
EeDaPP	Energy Efficiency Data Protocol and Portal	01/03/2018 – 31/08/2020	https://energyefficientmortgages.eu
ALDREN	ALliance for Deep RENovation in Buildings	01/11/2017 – 30/04/2020	https://aldren.eu
LIFE Level(s)	Life for LCA LCC Level(s) project	01/01/2019-30/09/2022	https://lifelevels.eu

Figure 11: European projects addressing property value

The most important European project for this task is certainly REVALUE project led by experts in the fields of property valuation with the main aim to help and support market transformation towards a more energy efficient stock by increasing awareness of the impact of energy efficiency on property value, and by establishing a link between investing in energy efficiency and long-term investment value.

The ZEBRA 2020 European project aimed to put nearly-zero energy buildings in Europe in the spotlight. One of the goals of the project was to analyse the impact of EPCs on property values. Within this project, an interesting survey was conducted investigating the opinion of real estate agents in 8 Member States (Austria, France, Germany, Italy, Norway, Poland, Romania, and Spain). The results of the real estate agents' survey provided significant recommendations on how to increase the impact of EPCs on the property value and how to overcome obstacles to wider use of EPCs across the EU. Also, an investigation of the assessment of regression study on EPC price surpluses for both the sales and rental markets is performed by analysing data in 12 EU countries confirming the existence of a greater surplus for sales transactions than rental transactions.

Although the main aim of the EU funded research project named CA EPBD IV was to support the transposition and implementation of the EPBD directive, one interesting factsheet within this project named *Impact of the EPC on the property value* (Heijmans et al) was published which was tried to evaluate the link between EPCs and property prices. Several interesting findings were concluded.

The main aim of developed Energy Efficient Mortgages Initiative (EEMI) valuation checklist was to complement existing valuation instructions in the context of mortgage lending. The purpose of the checklist is to record and report the information collected in a transparent way for the instructing bank. The objectives of EEMI, covering both the EeMAP and EeDaPP projects, were:

1. to propose a private initiative promoting energy efficiency investments in buildings,
2. to create a standardised EE mortgage to facilitate the acquisition of EE properties and the renovation of those not aligned with the EE norms,
3. to evaluate the availability of EE mortgage assets data across EU members and gather large scale datasets for investigating the link between buildings' energy efficiency features, its market value, and the loan's probability of default and loss-given-default.

One of the key objectives of EeMAP is to provide empirical evidence of a relation between energy performance of a building and the associated credit risk.

The main aim of the EU funded Horizon 2020 ALDREN project was to increase the rate and quality of non-residential building energy renovations (office buildings and hotels). Within this project set of financial indicators were developed and energy and non-energy benefits (also called direct and indirect benefits) associated with deep renovation were highlighted. The importance of developing a broader vision of the economic benefits associated with energy, health and well-being is stressed out.

Within the LIFE Programme funded project LIFE Level(s) a list of in total 16 score indicators were designed. The aim of the last indicator on the list named *Value creation and risk exposure* is to encourage the integration of sustainability aspects

into market value appraisal and risk rating processes. The indicator is designed to measure and track the positive influence of improved sustainability performance on a property financial valuation.

2.1.1 ZEBRA2020 – Nearly Zero-Energy Building Strategy 2020

The ZEBRA2020 ran from April 2014 to September 2016, monitored the market transition to nZEBs across Europe and aimed to deliver recommendations and strategies that accelerate the market uptake of nZEBs. ZEBRA2020 covered 88,6 % of the European building stock and 89,1 % of the European population (EU28 & Norway).

Within this project several indicators are evaluated to monitor the nZEB market transition. One of the indicators evaluated and monitored was value of property. ZEBRA2020 monitored inter alia energy performance certificates, energy efficiency measures and the integration of renewable energy sources.

Within ZEBRA2020 project the following two investigations were performed:

- survey market analysis among real estate agents,
  (D3.1 – The impact of energy performance certificates on property values and nearly zero-energy buildings – report for policy makers (July 2016) → focus on the existing housing stock)
- assessment of regression study on EPC price surpluses.
  (*The impact of energy performance certificates on property values and nearly zero-energy buildings - an analysis for market professionals, owners, and tenants* (September 2016))

In those two investigations, the impact of energy performance certificates on the property values and nearly zero-energy buildings was investigated.

Within D3.1 survey among real estate agents has been carried out in 8 countries (Austria, France, Germany, Italy, Norway, Poland, Romania, and Spain) and included 618 interviews in total. The aim of the survey was to collect real estate agents' professional opinion on what are the main factors that households consider when selecting properties to buy or rent. Additionally, the survey asked questions concerning impact of energy performance certification on the values of properties. Many of the statements regarding energy performance certification expressed by real estate agents were statistically slightly negative. A few answers showed positive opinions and the results varied among the countries.

At that time main elements considered when selecting, purchasing/leasing real estate were:

1. location,
2. price of the real estate and
3. the size of real estate.

The energy cost was on the 10th place among all factors.

Figure 3: Please rate, according to your experience as a real estate agent, the importance of each aspect for the choice of property. (1/3)

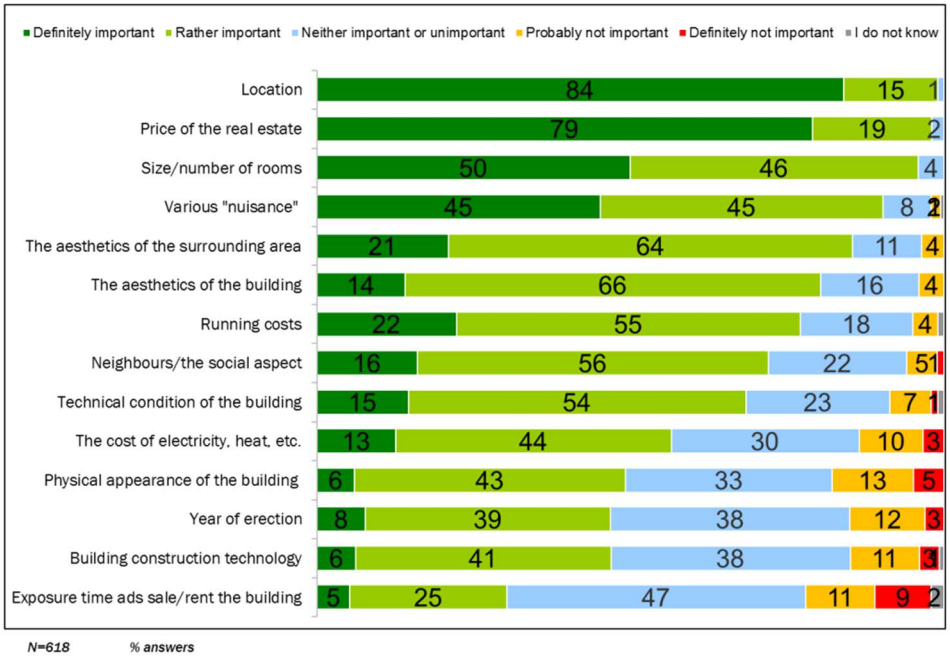

Figure 12: Results of real estate agent survey conducted within ZEBRA2020 project showing influencing factors for selection, purchase/lease of properties

One question asked was if real estate agents believed there is a cost premium associated with buildings with a high energy performance rating for renting or buying. At that time on average, real estate agents did not believe there was one, except in Germany.

Figure 11: Is there a rent/price surplus of buildings/flats with high energy performance rating?

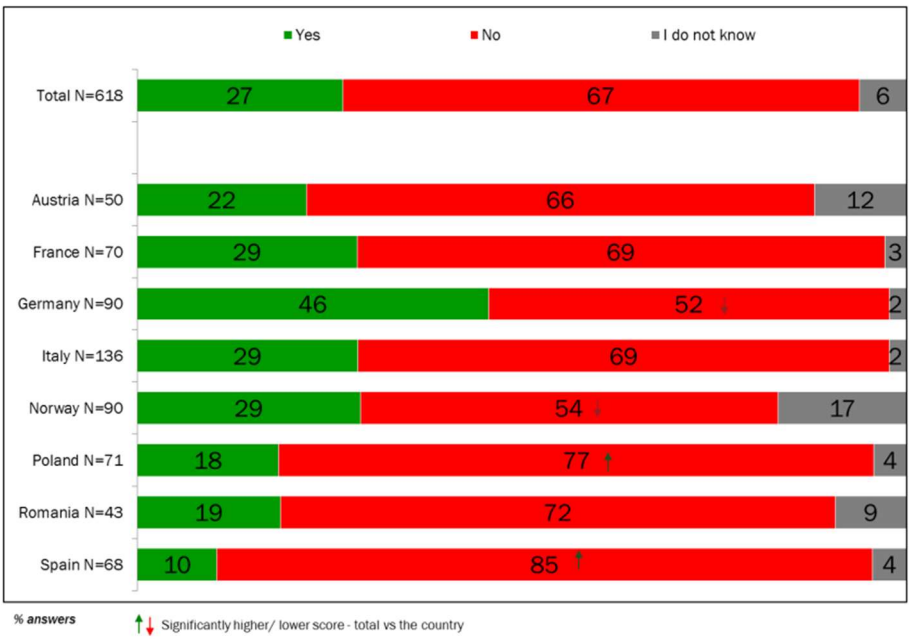

Figure 13: Results of real estate agent survey conducted within ZEBRA2020 project - Is there a rent/price surplus of buildings/flats with high energy performance rating

Within this survey real estate agents were also asked if the time to sell or rent a property with higher EPC rating (A, A+) is shorter in comparison to other classes. 75

% of interviewed respondents indicated that it was not the case, 14 % believed that the time to sell was indeed shorter and 11% had no idea.

Figure 13: Is the exposure time on the market of real estate with higher Energy Performance Classes (A, A gold etc.) and/or with labels shorter in comparison to others?

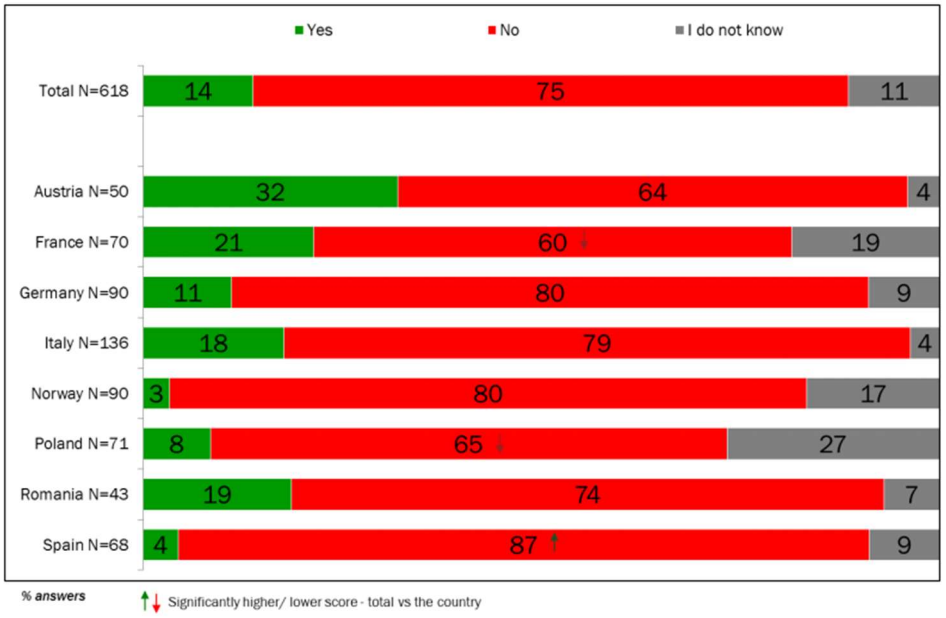

Figure 14: Results of real estate agent survey conducted within ZEBRA2020 project - Is the exposure time on the market of real estate with higher Energy Performance Classes and/or with labels shorter in comparison to others?

The main key findings from the project – real estate agent's survey (taken from the *D3.1 - The impact of energy performance certificates on property values and nearly zero-energy buildings - report for policy makers* from July 2016):

- The improvement of the energy performance of buildings is not linked to EPCs (45 % responses)
- A surplus price between higher energy classes and properties (when purchasing or leasing) was expected, but respondents do not find this association (67 % responses).
- The exposure time on real estate market does not differ between having a certificate or not of a property (indicated by ¾ respondents). Even the higher energy classes on the market do not shorter this time in comparison to the other remaining classes.
- Most clients are not interested with the purchase / lease of a real estate with high energy class (65 %).

Within the table below based on the analysis of the real estate agents' survey recommendations on how to increase the impact of EPCs on the property value and how to overcome many obstacles facing a wider use of EPCs across EU are provided.

Table 6: Overview of issues and recommendations elaborated based on statements from real estate agents within ZERBA 2020 project

No.	Issue	Recommendations
1.	Mandatory certification with EPCs, if not yet obligatory	Requirement by low of an EPC at each stage of real estate use (designing, primary market release, secondary market transactions, and renovations).
2.	Factors considered by clients whilst the selection, purchase, and lease of real estate	The energy cost factor becomes more important in line with higher energy prices.
3.	Evaluation of energy performance certificates in terms of the duty of its application	This duty may be better respected, if it is of investor/owner/manager obligation, requested in parallel by lawyers/notaries being witnesses of transactions.
4.	Evaluation of energy performance certificates in terms of reliability in the professional activity of real estate agents	The professional training and qualification of the certifiers and assurance of the quality control will increase reliability of the EPCs.
5.	Evaluation of energy performance certificates in terms of usefulness in the professional activity of real estate agents	The scope of information included in EPCs should be understandable by each property user. The market analysis and improvement of real estate valuation procedures by consideration of sustainable factors may increase the usefulness of EPCs
6.	Correlation between the high energy performance and high value of real estate	The market research and analysis of registered EPCs providing evidence for the impact of the energy performance of the buildings on their market value, could be used by the real estate agents in relations with their clients.
7.	Influence of having a higher EPC rating on the market exposure time	Market research and wider use of EPC ratings by real estate agents may shorten the exposure time of nZEB properties.
8.	Obstacles in improving the energy performance of buildings	They may be less important, if the cost of improvements and the cost of issuing of EPCs will be reduced by the state policy, accompanied by awareness raising campaigns and more fair division of profits from energy savings among the stakeholders (landlords, tenants)
9.	Incentives for real estate owners	Expected are economic incentives for those who are undertaking the energy savings measures, associated with well-designed information campaigns. Their introduction in a transparent way, not necessary by regulations and in the form of long-term programmes helps better understanding energy efficiency and climate change goals and the role of EPCs in this context.
10.	Increase the level of awareness and information about the EPBD	The upcoming recast of the EPBD is a good chance to implement training and awareness raising campaigns for a better understanding of the Directive’s aims and the impact of energy performance certification.

The aim of investigation on EPC surpluses was to obtain an estimation of price surpluses in each country analysed (Austria, Czech Republic, Denmark, France, Germany, Luxembourg, The Netherlands, Norway, Slovakia, Spain, Sweden, and the United Kingdom) caused by energy efficiency levels (through EPCs) given in sales and rental markets. Data on the characteristics of dwellings for both sales and rental advertisements in the selected countries was collected from different real estate agency websites (EPC ratings, advertised prices, the usable floor areas, construction years).

The investigation has demonstrated the existence of a price surplus due to energy efficiency in all but one of the countries analysed. The existence of a greater surplus for sales transactions than rental transactions is confirmed.

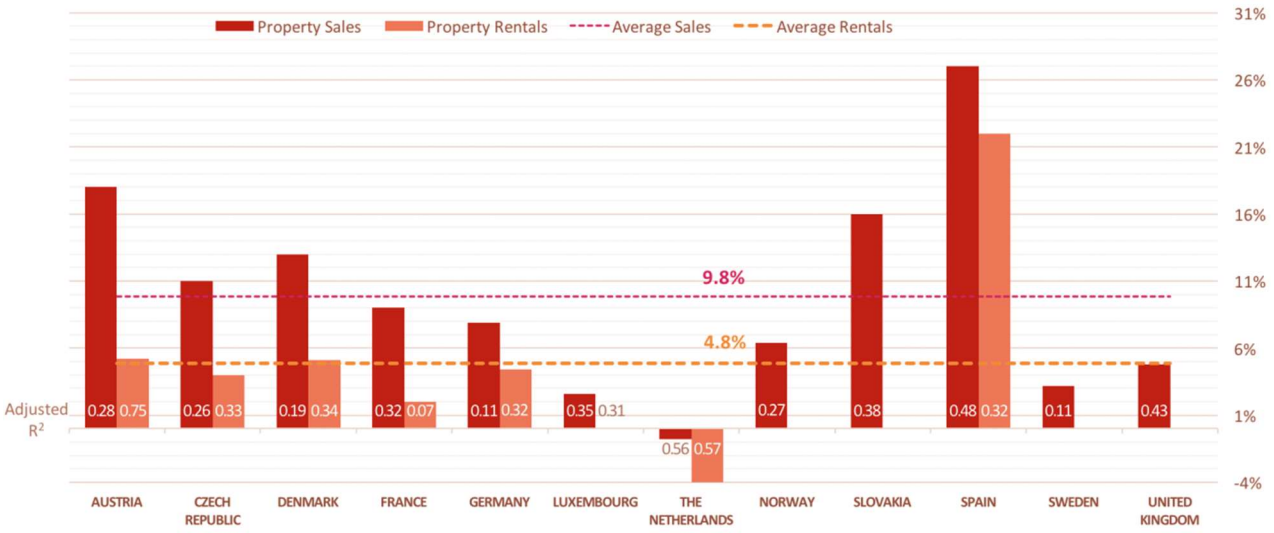

Figure 15: Results of investigation on EPC price surpluses (Source: study of De Graf, 2016)

Only in the Netherlands deficits instead of surpluses were observed for both the sales and rental markets.

2.1.2 REVALUE – Recognising Energy Efficiency Value in Residential Buildings

The HORIZON 2020 four-year project named REVALUE is of interest for this task because its aim was to develop a deeper understanding of the relationship between energy efficiency and residential values in selected European member states within rented (primarily social housing) stock. The project REVALUE ran from 01/03/2015 to 28/02/2019 and was led by experts in the fields of property valuation, building services, research, property regeneration and financial analysis. One of the in total six project partners was the Royal Institution of Chartered Surveyors (RICS) from United Kingdom. The REVALUE project addressed the residential sector and specifically the rented sector, which in Europe is dominated by social housing providers.

According to 2021 interactive edition Housing in Europe (https://ec.europa.eu/eurostat/cache/digpub/housing/index.html?lang=en) there are large differences within Europe on how we live in terms of size, kind and quality of housing and whether we own or rent. The highest home ownership rate among project partner countries has Croatia. It is well known that more developed European countries have a lower home ownership rate compared to the frontier countries, such as Croatia.

Table 7: Share of people living in households owning or renting their home with project partner countries involved in this task (year 2020)

Partner countries	Share of people living in households	
	owning their home [%]	renting their home [%]
Germany	50,4	49,6
Italy	–	–
Austria	55,3	44,7
France	64,0	36,0
Ireland	70,3	29,7
Croatia	91,3	8,7

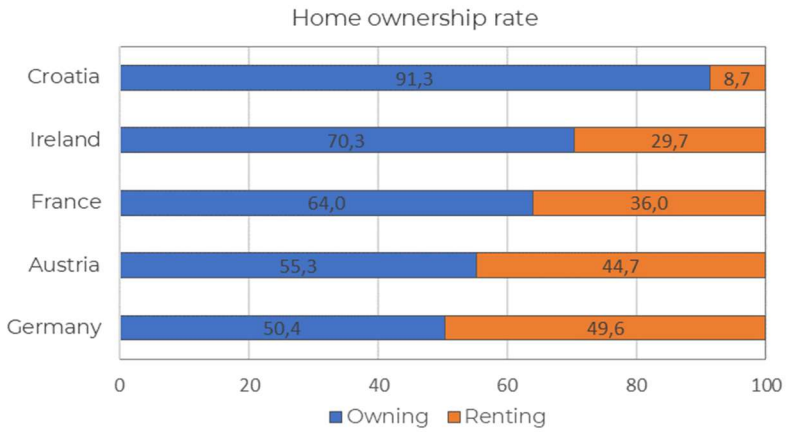

Figure 16: Share of people living in households owning or renting their home with project partner countries involved in this task (year 2020)

Aims of the REVALUE project:

- to explore the role of energy efficiency in valuation,

- to develop a deeper understanding of the relationship between value and energy efficiency,
- to support the development of clearer guidance for valuers,
- to develop updated/complemented international valuation guidance for property appraisers to help valuers to reflect the value of energy efficiency in their valuations of social and private housing stock,
- to help and support market transformation towards a more energy efficient stock
  - by increasing awareness of impact of energy efficiency on property value,
  - by establishing a link between investing in energy efficiency and long-term investment value,
- to assess the type of information that will enable more sophisticated assessments of energy efficiency in relation to property appraisals,
- to develop training materials for valuers.

Fundamental to the project:

- a consideration of the current and potential role of the valuer and of the content of their valuations in helping to address the need to upgrade property for greater energy efficiency,
- series of interviews, roundtables and in-depth discussions with selected portfolio owners were performed.

The main key findings from the project (taken from the Final report from August 2019):

- Valuation methods are inherently flexible and can accommodate the impact of sustainability. Further guidance for valuers must be developed but no new techniques are needed.
- Energy efficiency labels do not currently play a key role in determining values in the residential rented sector but some energy characteristics, notably visual ones such as high-quality glazing, are factored in.
- EPCs have raised awareness but could be more effective if consistency and occurrence were improved.
- Although EPCs do not exert a key role in determining value, there is often limited energy data availability and where there is data available, it does not readily integrate with valuations.
- Despite this, moves to encourage investment in greater energy efficiency places a need for valuers to work with energy experts and develop greater knowledge around renewable energy sources and how they change the technology used in buildings.
- The motivation to upgrade is based on a range of factors. For social housing providers; making capital gains through 'added value' is not the key driver.

In the final report it was concluded that the evidence points to energy efficiency beginning to impact value, though at a small scale compared with traditional value drivers.

2.1.3 CA EPBD IV – Concerted Action EPBD IV

The EU funded CA EPBD IV research project (Concerted Action EPBD IV) ran from 01/10/2015 to 30/09/2018 with the main aims:

- to support transposition and implementation of Directive 2010/31/EC of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings and
- to foster exchange of information and experience among Member States and participating countries with regards to the implementation of the specific Community legislation and policy on the energy performance of buildings.

The project was coordinated by the Danish Energy Agency (DEA). The CA consortium was composed of organisations designated by all 28 Member States plus Norway.

One factsheet within this project named *Impact of the EPC on the property value* (Heijmans et al. from the Belgian Building Research Institute) is of interest for this task because it evaluates the link between EPCs and property prices. In the factsheet it is stressed out that the primary objective of the EPBD is to raise awareness about building's energy performance to initiate market transformation. Potential building buyers or tenants, when informed about EPC rating, can better decide whether or not they want to buy/rent the building, plan possible renovation measures and/or negotiate the property or rental price. The authors stated that if a higher EPC rating's positive impact on property values is documented, this could be seen as an indicator of the EPC's success.

Many studies analysing the impact of the EPC on the property value were identified within this factsheet. Most of the studied use the hedonic pricing model (hedonic regression) for the analysis to split up the value of the property based on characteristics of the property.

At that time (September 2017) within studies analysing the impact of the EPC on the property value the following difficulties were noted:

- identification of relevant characteristics and cross-correlation between characteristics,
- access to data, due to national or European data protection laws, especially if the researcher is not the data owner,
- availability of EPC data, even if compulsory,
- availability of data related to the characteristics identified in the model,
- rapid changes in the real estate market that may not be fully captured by the data collected,
- availability of the final sales price (rather than the price that the property was advertised at).

In the frame of their literature review authors of the factsheet mentioned *Study for the European Commission* (2013). At that time, although the requirement to have an EPC published in advertisements when selling or renting a property was not obligatory (analysed countries: Austria, Belgium, France, Ireland, and the United Kingdom), a clear relationship between a property's energy performance and its advertised price or rent was identified.

The authors of the study also mentioned ZEBRA project and a conference paper from 2017 named *What will you pay for an 'A' - a review of the impact of building energy efficiency labelling on building value*.

The authors also gave brief description of situation related to effect of the EPC on property values in the Netherlands, Portugal, and France.

The following findings were concluded:

- a correlation between the EPC and the property price exists, except in specific market condition,
- the impact is the largest for poorly performing buildings,
- the impact on the price is higher for property sales than in the rental market,
- the determination of the EPC impact on the property value remains a very difficult task,
- the main challenge is the lack of access to sufficient data,
- the official EPC database does not include data about sales or rental transactions (in many MSs, databases must be cross-referenced with each other),
- cross-comparison between MSs should be made with caution because EPC schemes are different.

The study showed when renovating old inefficient buildings to highly efficient ones that the EPC rating had its highest impact on the real-estate value. Moreover, the impact of the EPC rating is more evident on the real-estate resale value than on rent price.

2.1.4 EeMAP – Energy efficient Mortgages Action Plan

The EU funded EeMAP research project (Energy efficient Mortgages Action Plan) ran from May 2017 to April 2019 with the main aim to deliver a standardised framework based on a market benchmark to stimulate EE investment by households in the EU' s housing stock by way of a private banking financing mechanism.

Within this project so called EEMI (Energy Efficient Mortgages Initiative) valuation checklist is developed aimed at complementing existing valuation instructions in the context of mortgage lending. The purpose of the checklist is to record and report the information collected in a transparent way for the instructing bank.

Also, within this project initial recommendations for energy performance indicators and a building energy passport are provided to underpin a European energy efficiency mortgage. Building energy or renovation 'passports' can improve the availability of data for valuers and lenders and ensure that any renovation works are planned and implemented in a technically sound manner.

The following two challenges were overcome:

- compilation of detailed knowledge of the building performance assessment landscape relevant to energy efficiency mortgages at the Member state level,
- engagement of the regions' largest lending institutions.

Three key outputs were: a framework for a building energy passport, recording the EE history of a property by recognising the improvements made; a framework that can integrate the "green value" of a property through EE and collected market data; the framework for an EE mortgage product.

The EeMAP Project brought together all the necessary competencies (financial, building and EE, property valuation, energy provision and data) to develop a credible, workable, and marketable pan-European energy efficient mortgage initiative.

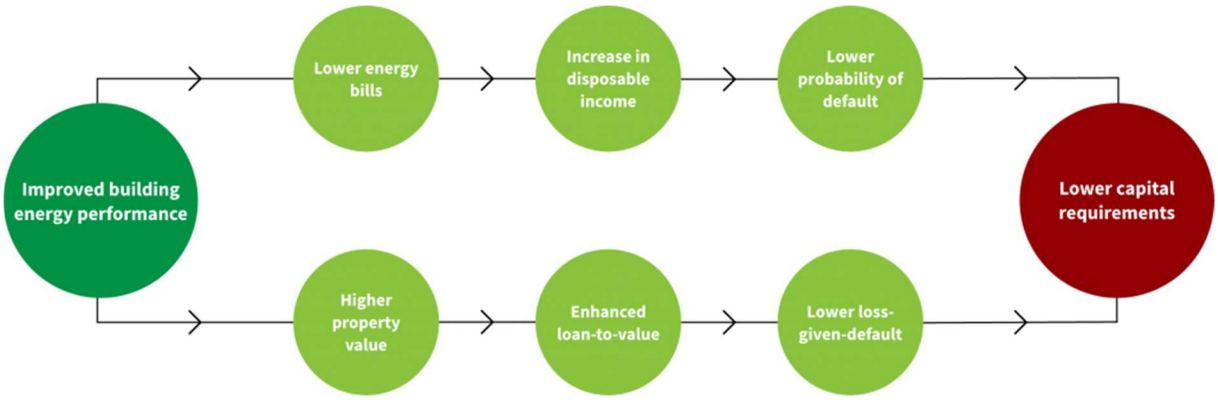

Figure 17: Benefits of improved building energy performance

2.1.5 EeDaPP – Energy Efficiency Data Protocol and Portal

The EU funded EeDaPP research project (Energy efficiency Data Protocol and Portal) ran from 03/2018 to 08/2020 with the aim to elevate the performance of the green securities market in the EU by providing performance traceability of energy efficient assets. Hence, allowing for the identification of energy efficient real estate assets for the energy efficient covered bond/bond issuance, and improving investor confidence in such securities. The project is coordinated by the European Covered Bond Council (ECBC) and the participation of 6 other institutes from Germany, Italy, and the Netherlands. By means of an Italian portfolio analysis, the project conducted a deep evaluation regarding the relation between the energy efficiency level of a property and the mortgage probability of default to which the owner might be exposed. Based on the Italian portfolio analysis, the project demonstrated that, a positive relationship exists between energy efficient investments and the reduction of the default risk. In terms of EPC ratings, the project found that building with an EPC rating bellow the C rating level compose the largest share of the Italian mortgage market (about 80%). According to the project research, the mortgages across Italian regions are not equally distributed, with about half of the issued loans are in Lombardy (46,38%) followed by Emilia Romagna (28,91%). Interestingly, the unequally of mortgages distribution seem to have no effect on the mortgages default risk results. Indeed, for most of the regions, the share of defaulted energy efficient mortgages (buildings rated B or better) is lower in compression to other inefficient buildings within each region. The researchers concluded that "*mortgages backed by energy efficient residential buildings are correlated with a lower risk of default. Additionally, the findings indicate that the degree of energy efficiency also matters, i.e., more energy efficient buildings are associated with relatively lower risk of default*".

2.1.6 ALDREN – ALliance for Deep RENovation in Buildings

The EU funded Horizon 2020 ALDREN research project (ALliance for Deep RENovation in Buildings) ran from November 2017 to April 2020 and gathered eight European partners with the main aim to increase the rate and quality of non-residential building energy renovations (office buildings and hotels). Within this project a harmonised energy performance rating based on the European Voluntary Certification Scheme (EVCS) is offered. Aligning market recognition of high quality with enhanced building value by financial tools and capacity building was offered too. The intention was to encourage investment and accelerate the movement towards a nearly zero energy non-residential building stock across the EU.

To provide information to a potential purchaser, investors, renter, or user of the building a Building passport was introduced, which is composed by two main elements: digital building logbook (ALDREN BuildLog) and renovation roadmap (ALDREN RenoMap). The ALDREN BuildLog is composed of in total six modules:

Module 1 BUILDING PICTURE

Module 2 ENERGY RATING & TARGET

Module 3 ENERGY VERIFICATION

Module 4 COMFORT & WELL-BEING

Module 5 COST VALUE RISK

Module 6 DOCUMENTATION BIM

The Module 5 COST VALUE RISK aims to evaluate impacts of energy and non-energy benefits associated with deep renovation on the financial value and risks of office and hotel buildings. The information gathered within three previous modules is shared with financial valuation experts who compare the financial impacts – costs, risks, and value with different renovation scenarios.

The main aim of ALDREN deliverable D2.5 - ALDREN Methodology note on linking the EVCS to financial valuation was to purpose methodology to link EVC indicators resulting from previous tasks (T2.1, T2.2, T2.3 and T2.4) to financial indicators so as to better highlight financial benefits of energy, health and comfort upgrades in terms of asset value and risk protection.

According to authors opinion highlighting financial benefits of deep renovation could help mobilise further investment and improve market financing conditions

Energy and cost savings reflect a narrow view off the financial benefits with sometimes long payback periods. To better integrate not only energy, but also health and comfort topics into financial valuation, risk appraisal and renovation decisions additional financial indicators are added in the building passport and EVC.

The financial benefits (benefits for owners) are both:

- **direct benefits**, **directly cashed by the owner**: costs savings that can be easily expressed (e.g., energy costs, maintenance costs, replacement costs) and have a direct impact on cash flows,
- **indirect benefits resulting from benefits to other stakeholders**: increased asset attractiveness, reduced obsolescence, higher rents, and lower risk of vacancy, which result from preferences of tenants and investors and thus also from local market conditions.

Three main types of indicators have been selected:

- **costs,**
- **financial value,**
- **financial risks.**

Figure 18 depicts selected additional economic indicators within three main types of indicators.

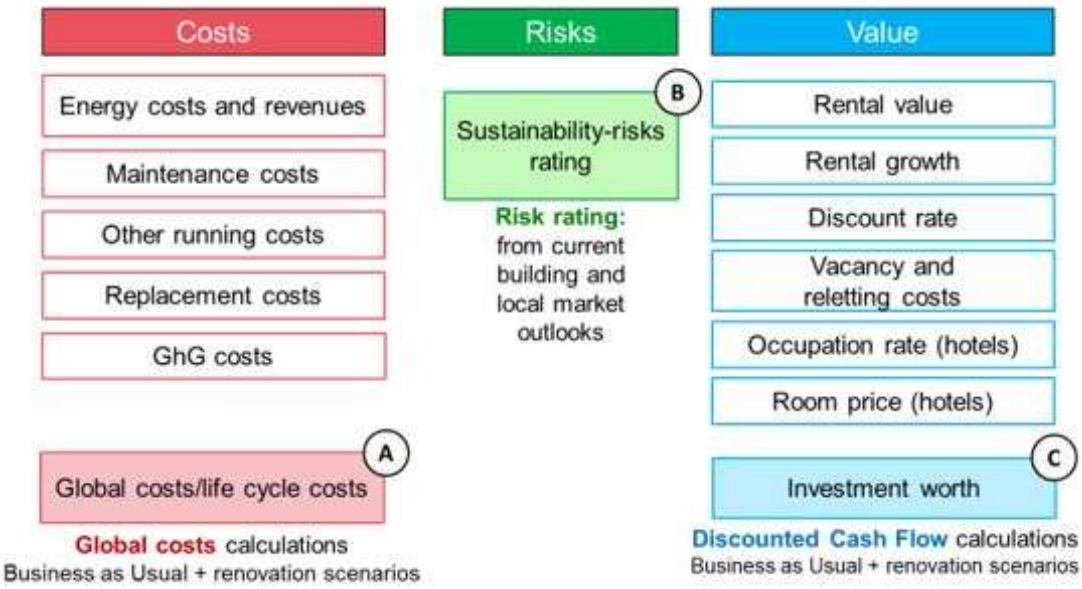

Figure 18: Overview of indicators within three main types of indicators defined within ALDREN project

It is particularly important to not only consider energy-related costs but to also consider other costs along the remaining of the building lifespan to develop a broader vision of the economic benefits associated with energy, health, and well-being.

2.1.7 LIFE Leve(ls) – the Life for LCA LCC Level(s) project

The two main objectives of the LIFE Programme funded project LIFE Level(s) (the Life for LCA LCC Level(s) project) (duration: 01/10/2019 – 30/09/2022) are to:

- mainstream sustainable buildings in Europe through greater awareness and use of the Level(s) indicators,
- integrate Level(s) across Europe reducing carbon emissions, waste, and indoor air pollution, increasing circularity.

Within this project a list of in total 16 core indicators (Table 8) were designed covering the following three main thematic areas:

- Resource use and environmental performance,
- Health and comfort,
- Cost, value, and risk.

Table 8: List of indicators set up within LIFE Levels project

Thematic areas	Macro Objectives	Indicators
Resource use and environmental performance	1. Greenhouse gas Emissions throughout building life cycle	1.1 Use stage energy performance [kWh/m²/yr]
		1.2 Life cycle Global Warming Potential [CO_2 eq./m²/yr]
	2. Resource efficient and circular material life cycles	2.1 Bill of quantities, materials, and lifespans
		2.2 Construction and Demolition waste and materials
		2.3 Design for adaptability and renovation
		2.4 Design for deconstruction, reuse, and recycling
	3. Efficient use of water resources	3.1 Use stage water consumption [m³/occupant/yr]
Health and comfort	4. Healthy and comfortable spaces	4.1 Indoor air quality
		4.2 Time outside of thermal comfort range
		4.3 Lighting and visual comfort
		4.4 Acoustics and protection against noise
Cost, value, and risk	5. Adaption and resilience to climate change	5.1 Life cycle tools: scenarios for projected future climatic conditions
		5.2 Increased risk of extreme weather
		5.3 Sustainable drainage
	6. Optimised life cycle cost and value	6.1 Life cycle costs [€/m²/yr]
		6.2 Value creation and risk exposure

The last on the list of defined indicators is the indicator named **6.2 Value creation and risk exposure**. The aim of this indicator is to encourage the integration of sustainability aspects into market value appraisal and risk rating processes and to ensure that this is done in as informed and transparent a way as possible. The indicator is designed to measure and track the positive influence of improved sustainability performance on a property financial valuation and/or a financial risk rating by considering the following three main potential areas of influence on value and risk appraisal:

- **increased revenues from more stable investments** (by making properties more attractive within local markets, by keeping void rates low and by enabling properties to be adapted to future market conditions),

- **reduced operational overheads** (by minimising operational expenditure relating to energy and water utilities, projected maintenance, repair, and replacement costs),
- **reduced exposure to future risk** (by anticipating potential future exposure to the effects of climate change).

For each of 15 core indicators designed (the last indicator is of course excluded from the list) within the LIFE level(s) project and for each of the potential areas of influences should with answer yes or no been decided that weather they will be taken into account in the financial valuation or not (weather these influences make the financial valuation) (see Table 9). The influence on the financial valuation is measured by difference between the valuation for a baseline or benchmark building design and the valuation for a building design with an improved sustainability performance.

Table 9: LIFE Level(s) – indicator 6.2 Value creation and risk exposure - table of reporting format

Indicators	Has the potential influence been taken into account in discussion with the client and their property market valuers?		
	1. Increased revenues from more stable investment	2. Reduced operational overheads	3. Reduced exposure to future risk
1.1 Use stage energy performance [kWh/m²/yr]			
1.1. Use stage energy consumption			
1.2 Life cycle Global Warming Potential [CO_2 eq./m²/yr]			
2.1 Bill of quantities, materials, and lifespans			
2.2 Construction and Demolition waste and materials			
2.3 Design for adaptability and renovation			
2.4 Design for deconstruction, reuse, and recycling			
3.1 Use stage water consumption [m³/occupant/yr]			
4.1 Indoor air quality			
4.2 Time outside of thermal comfort range			
4.3 Lighting and visual comfort			
4.4 Acoustics and protection against noise			
5.1 Life cycle tools: scenarios for projected future climatic conditions			
5.2 Increased risk of extreme weather			
5.3 Sustainable drainage			
6.1 Life cycle costs [€/m²/yr]			

2.2 Journals

Many interesting articles have been found within journals dealing with real estate property valuation.

Table 10: List of journals dealing with real estate property valuation

Journal acronym	Journal name	Publisher	Journal home page
–	European Valuer	TEGoVA	https://tegova.org/journal
JERER	Journal of European Real Estate Research	European Real Estate Society (ERES)	–
–	Journal of Corporate Real Estate	Emerald Insight	https://www.emerald.com/insight/publication/issn/1463-001X
JHR	Journal of Housing Research	Taylor Francis	https://www.tandfonline.com/journals/rjrh20
–	Journal of Property Research	Taylor Francis	–
–	Journal of Real Estate Finance and Economics	Springer	–
JOSRE	Journal of Sustainable Real Estate		https://www.tandfonline.com/loi/rsre20
–	Applied Energy	ScienceDirect	https://www.sciencedirect.com/journal/applied-energy
–	Building and Environment	ScienceDirect	https://www.sciencedirect.com/journal/building-and-environment
–	Energy and Buildings	ScienceDirect	https://www.sciencedirect.com/journal/energy-and-buildings
–	Energy Economics	ScienceDirect	https://www.sciencedirect.com/journal/energy-economics
–	Energy Policy	ScienceDirect	https://www.sciencedirect.com/journal/energy-policy
–	Sustainability	ScienceDirect	–

Figure 19: Real estate journals

2.2.1 European Valuer

The journal *European Valuer* includes a number of articles relating to energy efficiency and sustainability improvements and their effects on property valuation within the EU. These articles could more clearly be described as opinion pieces than scientific articles, and therefore do not contain the same level of detail to be found in a more scientific journal.

The first mention of Energy Performance Certificates dates back to the very first issue – September 2012 (Issue 1, page 4 of 5) – in an article describing the recent European Conference on '*EU Energy Efficiency Regulation and Funding for Buildings – Step change to a new real estate economy*'. This reference is in relation to the targets beings set out by the Energy Efficiency Directive and the Energy Performance of Buildings Directive.

The article '*EU Energy Efficiency Regulation and Funding for Buildings*' (January 2013, Issue 2, page 1 of 4) highlights the funding needed to provide necessary change to the EU's building stock and whether it can meet the requirements set out by Directives and Regulations.

'*In the Pipeline*' (April 2013, Issue 3, page 4 of 4) outlines ongoing developments relating to how access to high-speed broadband infrastructure will affect the market value of buildings within the EU, and how developments in the energy efficiency of the EU buildings stock will influence the valuer's analysis of the value of properties.

Another article (October 2014, Issue 9, page 3 of 4) discusses the theme of TEGoVA's next European Valuation Conference – '*The Greening of Valuation Practice*' – and highlights the issues associated with EPCs at that moment in time and how the conference hopes to contribute towards bettering them.

'*The Value of Sustainability*' (October 2014, Issue 9, page 3 of 4) discusses the challenges faced by the valuation profession in the face of growing emphasis on sustainability issues and how policymakers hope that this will affect the value of properties and drive the necessary change in behaviour. The article again highlights how ineffective EPCs are at driving change in property values.

The article '*Energy Performance Certificates – Issues of Quality Correlation with Market Value and Relevance to Valuers*' (April 2015, Issue 11, page 3 of 4) written by Michael MacBrien, an advisor to TEGoVA, reveals the potential negative impact poor quality EPCs may have on the perception for energy savings and any future measures and the need for their improvement.

'*The Union will have a carbon-neutral building stock by 2050 and valuers should surf that wave, not paddle after it*' (October 2019, Issue 17, page 2 of 4) argues that valuation has become a prime EU energy concern and there is a need for valuers to become more conscious of what is happening and to develop methods for integrating these changes into valuation processes.

In the article '*EU action for decarbonised affordable housing*' (February 2021, Issue 21, page 4 of 18) Ciaran Cuffe, MEP, sets out his vision of a European Renovation Wave tailored to local needs, and one leveraging decarbonisation to achieve better, safer, and more affordable living environments.

The editorial '*EU climate law will transform real estate. Valuation practice had better follow*' (September 2021, Issue 23, page 2 of 21) gives an insight into the European Green Deal legislative package and what this means for the EU real estate market.

The article '*Assessing the value at risk in the energy performance of European buildings*' (September 2021, Issue 23, page 12 of 21) develops on the trends being taken by the European Commission to tighten property energy efficiency regulations in the face of the climate crisis.

The '*Energy Performance of Buildings Directive – The transformation of real estate has begun*' (December 2021, Issue 24, page 7 of 30) editorial discusses the changes seen in the leaked draft of the European Commission's revised EU Energy Performance of Buildings Directive, including those relating to energy performance certificates and class. It is stated that legal obligations, introduced with the proposal for the 3rd revision of the Energy Performance of Buildings Directive, to renovate a building to a higher level of energy efficiency by a fixed date or a certain inflection point (e.g., rental, sale) will create an unavoidable major cost that impacts market value, as the owner at that data or inflection point will have to pay for renovation works. The valuers will have to estimate the cost of a renovation.

The article '*Cutting the carbon crap in real estate valuations*' (December 2021, Issue 24, page 14 of 30) argues that the green transition has barely started due to the current focus on labelling the energy efficiency of investment transactions – using token markers like BREEAM, LEED and other certification processes - rather than pricing the actual costs of decarbonisation.

2.2.2 Journal of European Real Estate Research

Several articles published by the Journal of European Real Estate Research have examined the relationship between EPCs and residential property values.

Wilkinson and Sayce "*Decarbonising real estate: The evolving relationship between energy efficiency and housing in Europe*" (2020 – Vol. 13 No. 3) examine the relationship between observed market prices and EPCs in several European studies. Results are variable. According to one large study, the impact is positive but not to the point where costs outweigh the value gain. However, for most studies energy efficiency technologies are associated with high returns on investment. The relationship is more nuanced for three case-study projects. While energy efficiency starts to impact real estate value, this influence is smaller than other value drivers such as health, well-being and private sector finance deals. Moreover, a "brown" discount is more likely to emerge than a green premium. Thus, more action are needed to decarbonise new and existing residential property in the European states considered.

In the same issue, Mc Cord et al. "*Energy performance certificates and house prices: a quantile regression approach*" (2020 – Vol. 13 No. 3) measure the dynamic effects of EPCs on house prices. The study is based on a data set of 1.478 achieved sales transaction drawn from the Ulster University House Price Index for the period Q2 2018 to Q1 2019 for the Belfast housing market, Northern Ireland. It examines both the impact of EPC and the potential EPC rating for improved energy performance based on an average energy cost improvement. The results indicate the existence of both a green and a brown effect. The relationship is strong for properties with

higher EPC scores. “There are also brown discount effects evident for lower-rated properties within F- and G-rated EPC properties at the higher end of the pricing distribution. Moreover, the potential energy efficiency rating (score) also shows increased effects with sales prices and appears to minimise any brown discount effects.” According to the authors energy performance is a complex feature that is not easily ‘averaged’ for valuation effect purposes”. Thus, they suggest to provide the market with more information, such as the CRREM pathways for residential property.

Taltavull et al. "*Impact of energy performance on transaction prices: Evidence from the apartment market in Bucharest*" (2017 – Vol. 10 No. 1) focus on the real estate market in Bucharest. Their aim is to estimate the premium attached to retrofitted apartments in Bucharest and to draw comparisons with international examples. The findings indicate a green premium in two Bucharest areas between 2,2% and 6,5%.

The paper written by Fregonara et al. "*Energy performance certificates in the Turin real estate market*" (2017 – Vol. 10 No. 2) assesses the impact of the EPC on the Italian real estate market, focusing on old buildings. In Italy EPC became mandatory for house transactions in 2009. The empirical analysis is based on a hedonic model and a sample of 879 transactions of old properties in Turin between 2011-2014. It reveals that EPC labels had no impact on prices. However, the results might be influenced by the area of the study (a big city such as Turin) and the context: the study covers the transactions established between 2011 and 2014, just two years after the introduction of EPC in Italy.

2.2.3 Journal of Corporate Real Estate

A study by Cajias et al. titled *Green performs better: energy efficiency and financial return on buildings* published in the Journal of Corporate Real Estate in 2013 investigated the effect of energy consumption on the financial performance of German residential buildings in a large panel framework. The authors provided evidence that energy efficiency in the residential sector at that time in 2013 was already a relevant factor affecting both tenant investment decisions and consequently the performance of investor portfolios.

Based on the IPD Database and information from the German statistical office, the authors created portfolios of buildings across several energy consumption levels to describe the energy pricing mechanism in the context of total return and rent price. Furthermore, the authors apply conditional and unconditional regressions over the period of 2008 and 2010, to accurately quantify the energy price premium in the German residential market.

The descriptive portfolio results show that energy-efficient buildings yield an up to 3,15 % higher return and 0,76 €/m^2 higher rent than inefficient buildings. Furthermore, the regression results indicate that a 1 % decline in energy consumption affects the total return of buildings positively by +0,015 %. The hedonic results additionally show that 1 % energy conservation boosts rent prices by +0,08 % and market value by +0,45 %. The paper contributed to prior European studies regarding the use and implications of energy performance certificates and confirms their significant impact on residential housing performance variables. Nowadays the results of this study are obsolete.

2.2.4 Journal of Housing Research

A study by Aroul et al. titled *"Fix it with Green:" The Valuation Impact of Green Retrofits on Residential Transaction Price* recently published in the Journal of Housing Research in 2021 investigated the valuation implication of green retrofits on residential transaction prices. The authors found that renovated properties in the sample of residential transaction prices were sold at price levels 5,8 % higher on average than properties that are not renovated, all else equal. However, green retrofits sell for 9,9 % higher on average than non-renovated properties, and green retrofits sell for about 12,7 % higher on average than non-green renovated properties. It appears that investment in residential green building features is capitalised in housing prices. The authors also found that green retrofitted properties spend fewer days on the market compared to other transactions.

2.2.5 Journal of Property Research

The article "*How does environmental efficiency impact on the rents of commercial offices in the UK?*" (Fuerst et al.) published in the Journal of Property Research in 2015 investigates the effect of BREEAM ratings on commercial office lease transactions between 2006 and 2010. The study indicates a premium of 23-26 % for BREEAM-certified buildings. The relatively high premium may also be attributed to the enhanced design specifications and to an „introduction" effect, as BREEAM is introduced in the market. The premium thereby varies, depending on the year of construction and certification, but BREEAM-rated buildings consistently outperform non-BREEAM-certificated buildings in 2007-2010. It appears as if the economic downturn has little to no effect on the size of the premium.

2.2.6 Journal of Real Estate Finance and Economics

The study by Chegut et al. (2019 - *Energy Efficiency Information and Valuation Practice in Rental Housing*) focused on valuation practices in rental housing in the Netherlands. Authors explored the degree to which valuation practices with respect to energy efficiency have changed from 2010 to 2015. They didn't observe a significant relationship between energy efficiency and assessed values in 2010, but in 2015 they found that more energy efficiency leads to higher external valuations. The authors documented that valuation practices have changed over time and have recently started to specifically value the energy efficiency of homes.

In the rental market, the study titled *What drives the premium for energy-efficient apartments–green awareness or purchasing power*? made by Pommeranz, C., & Steininger, B. I. (2021) showed that a 1 % increase in the EPC value decreases the rental price by around 2 %. This discount for higher EPC values is even higher if a neighbourhood is more environmentally cautious (based on Voting for the green party) or has higher purchasing power. However, they interestingly found that that highest negative impact of the EPC rating on the rental price (−8.6 % from A+ to H) is observed in real estate's objects located in neighbourhoods with low environmental awareness and high purchasing power.

2.2.7 Journal of Sustainable Real Estate

The paper named *Green Premium: What is the Implied Prognosis for Sustainability?* (Addae-Dapaah et al.) published online in the Journal of Sustainable Real Estate in June 2021 presents the results of a research analysing Building

Research Establishment Environmental Assessment Method (BREEAM) certified office buildings in the Greater London area to ascertain the prevalence of a green premium The study uses quantitative analysis (a hedonic model to analyse 2.842 transaction data points from 2008 to 2018 inclusive) and psychographic analysis based on primary data from a questionnaire survey of approximately 450 BREEAM certified building owners and occupiers in the Greater London area to address the research questions. The preliminary results of the hedonic model analysis show that BREEAM certification commands a rental and price premium of 4,3 % and 22,3 % respectively. In addition, the results of both the quantitative and psychographic analyses imply that the premium is more a novelty premium than green-premium. This warns that sustainability cannot be won on purely economic grounds.

Another paper research named *The Effect of Sustainability on Retail Values, Rents, and Investment Performance: European Evidence* (Op't Veld et al.) published online in the Journal of Sustainable Real Estate in June 2020 focuses on the retail sector in the Netherlands. Using a unique dataset, the researchers show that green properties have a significantly higher direct income return. Counterintuitively, nongreen properties have significantly higher rents and values. However, when this is explored further in a regression analysis, they show that the significant differences are not caused by the energy labels, but by other factors influencing the performance of a retail property. The total return, vacancy rate, and operating costs also have no significant relation to the sustainability level of a property. The researchers conclude that they do not find evidence of a market premium for sustainable retail properties.

The aim of this paper named *Real Estate Price Formation: Energy Performance Certificates and the Role of Real Estate Agents* (Olaussen et al.) published online in the Journal of Sustainable Real Estate in December 2021 is to study whether the introduction of EPCs changes the asking price setting of real estate agents. The research refers to data collected in Norway, where a mandatory energy certification system has been operational since 2010.

Previous studies often showed contradictory results in relation to the impact of energy label of dwellings and the transaction prices.

A study of Olaussen et al. (2017) showed that, in Norway, buyers either ignore the EPCs at the purchasing moment or that they are informed about the energy performance of dwellings through other channels, in both cases making the EPCs redundant.

The present study provides evidence that real estate agents may represent such a channel. The 2021 study shows that real estate agents have been able to adjust the asking price to the genuine energy standard of dwellings both after and before the implementation of EPCs. That is, by the capacity of setting the asking price, real estate agents provide buyers with information about the energy efficiency of dwellings quite independently of the energy label. It seems that the EPCs do not provide additional information to the real estate market. So even if the energy performance of buildings matters in the purchasing decision, our study provides evidence that real estate agents were able to pick up and mediate information about the energy performance before the EPC introduction.

Moreover, the high correlation between the asking price and the actual sales price indicates that real estate agents are well trusted by the market.

Based on this, the research states that the price signal that buyers receive from real estate agents through the asking price is more important than the signal received from the energy label.

This may also indicate that real estate agents have a more pronounced role as a provider of information during the transaction process in the Norwegian real estate market with respect to other countries.

The conclusions of the study, based on the analysis both of a hedonic model and a fixed effect model, point out that the implementation of EPCs in Norway did not affect the price setting of real estate agents. Energy labels have low or no impact on transaction prices. This indicates that real estate agents either disregard EPCs as providers of new information or believe that the market is indifferent to this kind of information.

2.2.8 Science direct journals

Below a list of papers dealing with real estate property valuation published by Science Direct.

2.2.8.1 Applied Energy

The paper published within the Applied Energy in March 2022 named *The valuation of buildings energy retrofitting: A multiple-criteria approach to reconcile cost-benefit trade-offs and energy savings* (Bragolusi et al.) aims to provide a valuation framework to identify cost-effective and cost-optimal strategies of intervention, which match technological innovation in buildings energy renovations with environmental concerns and social awareness. The authors complemented the Life Cycle Cost method with the Net Present Value rule and determined the best retrofit project by implementing a two-criteria (i.e., reduction in primary energy consumption and increase in the present value of net benefits compared to the status quo), additive-value decision model. They also proposed a graphical approach, which provides a straightforward identification of the best compromise solution between Net-Present-Value maximising and energy-saving maximizing buildings' energy retrofit projects. The authors tested the proposed approach on a real-world case study and found that it is less sensitive than other methodologies to uncertainty over discount rates and future energy prices.

Highlights from this paper:

- A novel valuation approach based on cost-benefit trade-offs is proposed within this paper.
- We identify cost-effective and cost-optimal strategies of intervention.
- We implement a two-criteria, additive-value decision model.
- A graphical approach is proposed for the identification of the best retrofit solution.

Another paper of interest for this task published within the Applied Energy ten years earlier (January 2012) named *Impact of energy efficiency measures on the economic value of buildings* (Popescu et al.) discussed whether a market-based instrument, capturing the increase of the economic value of energy efficient buildings, can be used. Methods that quantify the added value due to energy performance, including recommendations on how they can be incorporated in the financial analysis of investments in weatherization, were developed. By applying the proposed methods, the payback period of investments in energy efficiency measures depends on two factors: potential energy savings and the added value to the property. Case studies on some existing condominiums from Romania are analysed and provided evidence to the research question.

Highlights from this paper:

- Market driven reasons can strengthen implementation of energy policies in buildings.
- Methods that quantify the added value due to energy performance are developed. Recommendations on how they can be incorporated in the financial analysis are presented.
- Case studies on some existing condominiums from Romania are analysed.
- The market sensitivity to energy efficiency measures is also in the focus.

2.2.8.2 Building and Environment

In the paper named *Sustainability assessment of renovation packages for increased energy efficiency for multi-family buildings in Sweden* (Brown et al.) published in Building and Environment in March 2013 a method for assessing renovation packages drawn up with the goal of increasing energy efficiency was proposed. The method included calculation of bought energy demand, life-cycle cost (LCC) analysis and assessment of the building according to the Swedish environmental rating tool Miljöbyggnad (MB). In this way the methodology assesses economic, indoor environmental quality (IEQ) and specifically environmental aspects associated with energy demand of such packages from a sustainability point-of-view. Through MB, energy efficiency packages were placed in context with other necessary measures required to improve environmental performance in buildings, providing a consistent and systematic basis other than simply financial performance by which to compare capital improvements.

The proposed method is analysed by applying it in three case studies. In each case study a multi-family building representing a typologically significant class in the Swedish building stock is considered, and for each building a base case and two renovation packages with higher initial investment requirement and higher energy efficiency are defined. It was shown that higher efficiency packages can impact IEQ indicators both positively and negatively and that packages reducing energy demand by approx. 50 % have somewhat higher LCC. Identified positive IEQ impacts point to added value for packages that may not otherwise be communicated, while negative impacts identify areas where packages need to be improved, or where MB indicators may be referred to as specifications in procurement procedures.

2.2.8.3 Energy and Buildings

There is one interesting study by Economidou et al. titled *Review of 50 years of EU energy efficiency policies for buildings* published in the Energy and Buildings in 2020. providing a review of EU energy policies spanning over the last half century focusing on policy instruments to encourage measures on energy efficiency in new and existing buildings. The progress made over the last 50 years in addressing energy efficiency in buildings is explored and success and remaining challenges are highlighted. This study refers also on the relationship between energy performance and property value. It is noted that several studies on the Swedish, Irish, Italian, Spanish, UK, and Dutch have identified a positive correlation between energy performance and property value. Premiums for energy efficiency ranged from 1,8 to 5 % for UK, 2,0–6,3 % for Dutch, 6–8 % for Italian and 5,4% and 9,8% for Spanish dwellings. For commercial properties, an empirical analysis showed that inefficient buildings of EPC labels D or below were linked to rental price levels around 6,5 % lower compared to energy efficient ones. On the other hand, some studies also identified a negligible or weak relationship between energy performance and property value.

2.2.8.4 Energy Economics

An interesting paper published in the Energy Economics in 2016 named *Does energy efficiency matter to home-buyers? An investigation of EPC ratings and transaction prices in England* (Fuerst et al.) studied the resale value of over 333.000 dwellings that were sold at least twice in the period from 1995 to 2012 and found a

positive correlation between energy performance rating and value of the dwelling. In their study they concluded that dwellings with the rating A and B are sold for a premium of 1,8 % over those rated C and a 5 % a premium against D rated dwellings. Lower rated building such as F and E are sold for approximately 1 % less than higher rated objects. Dwelling that are with an EPC rating of G are sold for almost 7 % less. In the rental market, rented dwellings with A- or B-rating obtained a premium of about 3 %. For less efficient budlings with a F and G rating a discount of 3,2 % for was observed.

A similar outcome is also observed in Germany. Taruttis, L., & Weber, C. (2022) made a study named *Estimating the impact of energy efficiency on housing prices in Germany: Does regional disparity matter*? to estimate the impact energy efficiency on housing prices in Germany. In their study a positive relationship between energy efficiency and asking prices was observed. A reduction in building final energy use by 100 kWh/(m^2a) causes a 1,3 % increase in asking prices per m^2. This is especially the case in large metropolitan cities. They found that in regions with a low housing supply, the energy efficiency rating of building show a neglectable impact on the asking price. However, in rural and in sparsely populated areas the increase in the asking price can reach up to 11,4 %. Moreover, they noted that when considering a useful building lifetime of about 25 years, 98 % of the energy cost savings are already reflected in higher asking price of dwellings.

The paper named *The value of domestic building energy efficiency – evidence from Ireland* (Hyland et al.) published in the Energy Economics in November 2013 analysed the effect of energy efficiency ratings on the sale and rental prices of properties in the Republic of Ireland. Using the Heckman selection technique, the authors modelled the decision to advertise the energy efficiency rating of a property and the effect of energy efficiency ratings on property values. Their results showed that already in 2013 energy efficiency had a positive effect on both the sales and rental prices of properties, and that the effect was significantly stronger in the sales segment of the property market. The authors of this paper also analysed the effect of energy efficiency across different market conditions, and they found that the effect of the energy rating is generally stronger where market conditions were worse.

Highlights from this paper:

- We estimate the effect of energy efficiency on property sale and rental prices.
- We examine how this effect varies according to market conditions.
- Energy efficiency has a significant, positive effect on property values.
- The premium is greater for property sales compared to rentals.
- The premium for energy efficiency is greater when market conditions are worse.

2.2.8.5 Energy Policy

An article named *The impact of Energy Performance Certificates on the rental and capital values of commercial property assets* (Fuerst et al. – 2011) published in Energy Policy in 2011 at that time as expected found no significant evidence of effects of BREEAM and EPC ratings on market rents and market values of commercial property (offices, retail, and industrial assets). However, the authors do

find evidence to suggest that equivalent yields are affected by BREEAM and EPC ratings.

Paper named *Energy performance ratings and house prices in Wales: An empirical study* (Fuerst et al. – 2016) published in Energy Policy in 2016 investigates the effect of Energy Performance Certificate ratings on residential prices in Wales. Drawing on a sample of approximately 192.000 transactions, the capitalisation of energy efficiency ratings into house prices is investigated using two approaches. The first adopts a cross-sectional framework to investigate the effect of EPC rating on price. The second approach applies a repeat-sales methodology to investigate the impact of EPC rating on house price appreciation. Statistically significant positive price premiums are estimated for dwellings in EPC bands A/B (12,8%) and C (3,5%) compared to houses in band D. For dwellings in band E (−3.6%) and F (−6.5%) there are statistically significant discounts. Such effects may not be the result of energy performance alone. In addition to energy cost differences, the price effect may be due to additional benefits of energy efficient features. An analysis of the private rental segment reveals that, in contrast to the general market, low-EPC rated dwellings were not traded at a significant discount. This suggests different implicit prices of potential energy savings for landlords and owner-occupiers.

Another opinion paper published in Energy Policy in 2020 named *Valuation of energy performance certificates in the rental market - Professionals vs. non-professionals* (Khazal et al., 2020) investigates the impact of EPCs on the residential rental market in Norway, adding to the existing EPC literature.

It also studies potential heterogeneity in EPC valuation among market actors by defining two lessor types – professionals (real estate agents) and non-professionals (homeowners). The researchers apply the hedonic multilevel approach on a highly representative dataset of some 440.000 observations over the whole of Norway for the period 2011–2018 and find that labelled dwellings are associated with a premium compared with non-labelled dwellings; green labels (A, B and C) have a premium of 5,8 % and non-green labels (D, E, F and G) have a premium of 2,5 %. When we instead consider each label separately, premiums are increasing with higher EPC rating, with 5,1 %, 6,6 % and 6,9 % higher rents for C-, B- and A-labels, respectively. Comparing only labelled dwellings, improvements in energy efficiency from a G-label to an A is expected to yield a rental premium of about 5,9 %. Further, for dwellings with the same characteristics and EPC-label, we find that professionals assign higher rents compared with non-professionals. Dwellings with high energy efficiency are associated with a 5,0 % higher premium if rented out by a professional, where 1,8 % is the difference in green-label valuation.

A Chegut et al. (2016) in their study named *Energy efficiency and economic value in affordable housing* published in the Energy Economics examined the impact of the EPC rating on the real estate value of over 17.000 dwellings sold by Dutch affordable housing institutions in a year's 2008 to 2013. The results showed that an A labelled building was sold or valued with a 6,3 % premium in comparison to similar C rated dwelling. For a B rated dwelling this premium is 2,0 %.

Comparable results were also obtained in the study named *The price of energy efficiency in the Spanish housing market* by De Ayala et al. (2016). The study of real-estate value of a sample of 1.507 homes across Spain showed that residential

buildings labelled A, B or C are valued at a 9,8 % higher price in comparison to D, E, F or G rated homes.

2.2.8.6 Sustainability

Brocklehurst et al. (2017). in their article titled *What will you pay for an "A"?* reviewed peer reviewed 15 papers that attempted to investigate the impact of building energy efficacy labelling on building value in 15 EU countries. The results of their review showed a positive correlation between the building's sale value and its EPC rating. The authors noted that this trend can be clearly observed since compulsory EPC advertising was introduced in the 2nd EBPD in 2010.

The study made by Mangialardo et al. (2018) titled *Does sustainability affect real estate market values? Empirical evidence from the office buildings market in Milan (Italy)* went a step further by analysing the impact of sustainability label on the value of real estate assets. In their study they have examined the transaction price of 55 non-residential buildings in Milan 30 of which are certified with the LEED sustainability label. Their study showed that a premium of 7,4 % can be obtained with LEED Gold certification and Platinum one with a further positive variation of more than 11 %. Moreover, the study found that buildings with a sustainability certification are rented twice faster than non-certified.

2.3 Journals at national level

In each project partner country, there is at least one journal dealing with real estate published at national level.

Table 11: List of journals dealing with real estate at national level

Country	Journal title in the original language and translated into the English language	Publisher	Journal home page
Germany	Zeitschrift für Immobilienökonomie (*German Journal of Real Estate Research*)	Deutsche Gesellschaft für immobilienwirtschaftliche Forschung gif e.V.[1]	https://www.gif-ev.de/forschung-studium.565/show/zioe
Italy	Consulente immobiliare (*Real estate consultant*)	Sole 24 Ore (Italian national newspaper)	https://24oreprofessionale.ilsole24ore.com/prodotti/consulente-immobiliare/
	QEI-Quaderni di Economia Immobiliare (*Real Estate Economics Notebooks*)	Tecnoborsa	https://www.tecnoborsa.com/qei-quaderni-di-economia-immobiliare
	REview	3D Edizioni Srl	https://www.monitorimmobiliare.it/pubblicazioni/categoria-review/
	REquadro	3D Edizioni Srl	https://www.requadro.com/
	Consulenza immobiliare (*Real Estate Consultancy*)	Gruppo Euroconference Spa	www.euroconference.it/editoria/consulenza_immobiliare
	QI - Quotidiano Immobiliare (*Daily Real Estate*)	Daily Real Estate	https://www.ilqi.it/settimanale
Austria	Österreichische Zeitschrift für Liegenschaftsbewertung (*Austrian Journal of Property Valuation*)	MANZ Verlag	https://www.manz.at/produkte/zeitschriften/zlb
France	Operations immobilières (*Real Estate Operations*)	Le Moniteur Group	https://boutique.lemoniteur.fr/les-magazines/operations-immobilieres-revue.html
	BIG Business Immo Global (Real Estate Business)	Business Immo Group (belonging to CoStar Group)	https://www.businessimmo.com
	Réflexions immobilières (*Real Estate Insights*)	IEIF, Institut de l'Epargne Immobilière et Foncière (Institute of Real Estate and Land Savings)	https://www.ieif.fr/produit/reflexions-immobilieres
	IMMOWEEK	IMMOWEEK / PBo Initiatives Presse	https://www.immoweek.fr/
	Journal de l'Agence (*Real Estate Agency Journal*)	JDA Editions	https://www.journaldelagence.com
	RE-flexions (*Real Estate reflexions*)	Deloitte	https://www2.deloitte.com/fr/fr/pages/immobilier/articles/magazine-reflexions.html
	CFNEWS Immo *(Corporate Finance News Immobilier)*	Corporate Finance News (Paris)	https://www.cfnewsimmo.net/

[1] Society of Property Researchers, Germany

Country	Journal title in the original language and translated into the English language	Publisher	Journal home page
	Décideurs magazine (*Decision-makers magazine*)	Leaders League	https://www.magazine-decideurs.com/
	Le Cercle de l 'IFEI (The Circle of IFEI)	IFEI, Institut Français de l' Expertise Immobilière, (French Institute of Real Estate Valuation)	https://www.ifei.org/FR/FrontOffice/Publications.awp
	Workplace magazine	Pyc Media (under the aegis of ARSEG)	https://workplacemagazine.fr/calameo
	OID Observatoire de l' Immobilier Durable (*Sustainable Real Estate Observatory*)	OID association	https://o-immobilierdurable.fr/
	TALOEN (OID resources center)	OID association	https://www.taloen.fr/
	Radio Immo	–	https://radio.immo/live/1-Radio-immo-fr
Ireland	SCSI reports	Society of Chartered Surveyors Ireland (SCSI)	https://scsi.ie/scsi-commercial-property-market-monitor-review-and-outlook-report/
Croatia	Vještak (*Witnesses*)	Croatian association of court expert witnesses and valuers	https://www.sudski-vjestaci.hr/Casopis-Vjestak/

Figure 20: Journals at national level (Germany, Italy, Austria, France, Ireland, Croatia)

2.3.1 Germany

ZIÖ – Zeitschrift für Immobilienökonomie (German Journal of Real Estate Research) is published by the Deutsche Gesellschaft für immobilienwirtschaftliche Forschung gif e.V. (Society of Property Researchers, Germany). The Journal publishes the results of real estate research that contribute to the advancement of the real estate sector, both in Germany and internationally.

Steininger et al. (December 2018) in the paper named *Perception and Price Effect of Energy Performance Certificates on the German Residential Market* (*Wahrnehmung des Energieausweises in hypothetischen und realen Mietentscheidungen auf dem deutschen Wohnimmobilienmarkt*) researched the impact of the energy certificate rating on the rental decisions on the German residential real estate market. In the first part of the research, the authors investigated by means of Choice-Based Conjoint-Analyse (CBCA) the extent to which the energy rating of a residential property influence a hypothetical rental decision. The CBCA results showed that the energy rating of a property indeed contribute significantly to the rental decisions (relative importance of 25 %) right after the location and net rent price. This importance can be attributed to the anticipated low heating costs of such energy efficient properties. Thus, the researchers concluded that criterion of energy efficiency belongs to the group of important characteristics that decisively influence the selection of rental residential. In the second part of the research, they investigated the general impact of the energy efficiency class on the rental price of apartments in the state of North Rhine-Westphalia (NRW) via a hedonic regression method. In their investigation, they analysed the impact of the EPC rating class on the rental price of over 400.000 rental properties in NRW for the period between 2011 and 2016. The Results showed that energy-efficient rental properties rated between (A+ to C), a rental price premium of 1,5 to 7,1 % can be achieved over a D rated rental apartment. On the other hand, there are small price reductions of −0,6 to −2,2 % for rental apartments that are less energy-efficient (E to H). Interestingly, the price premium for energy-efficient remained almost consistent in both a buyer's and a seller's real estate market.

Using a meta-analysis framework, Fuerst et al. in the article named *Is there a scientific consensus on the economic viability of sustainable buildings*? (*Gibt es einen wissenschaftlichen Konsens zur Wirtschaftlichkeit nachhaltiger Immobilien*?) analysed 42 international studies published between 2010 and 2016 that addressed the topic of the profitability of sustainable buildings. Their research results showed that a sale price premium of about 7,5 % and rental price premium of 6 % can be observed for sustainably labelled buildings.

2.3.2 Italy

Main publications for the real estate market in Italy are the following:

Consulente immobiliare (Real estate consultant), monthly magazine published by Sole 24 Ore (Italian national newspaper), is aimed at professionals in the real estate sector and addresses current and interesting issues with the aim of updating on regulatory developments and "taking stock" of the most complex issues. There are many articles dedicated to the issues of environmental and energy sustainability improvement of buildings and their impact on the real estate market. https://24oreprofessionale.ilsole24ore.com/prodotti/consulente-immobiliare/.

QEI-Quaderni di Economia Immobiliare (**Real Estate Economics Notebooks)** is a six-monthly periodical published by Tecnoborsa (Organization of the Chambers of Commerce for the development and regulation of the Italian Real Estate Market). Born in 2003 to contribute to the creation of a national culture in the real estate field, QEI are aimed at a very wide audience ranging from institutional subjects to private individuals, from sector operators to great experts. They cover three issues a year - two ordinary and one special - and deal with major national and international issues affecting the real estate market in all its aspects: research, regulations, procedures, analyses, and insights. https://www.tecnoborsa.com/qei-quaderni-di-economia-immobiliare

REview is a weekly publication aimed at all real estate market operators that provides technical, financial and fiscal updates.
https://www.monitorimmobiliare.it/pubblicazioni/categoria-review/

REquadro is an online magazine (for subscribers only) that provides a wide range of information including legal and fiscal aspects, tenders, and regulations. https://www.requadro.com/

Consulenza immobiliare (Real Estate Consultancy) is a bimonthly magazine dedicated to the world of real estate, aimed at professionals engaged in property valuation and tax and contractual consultancy.
www.euroconference.it/editoria/consulenza_immobiliare

QI – Quotidiano Immobiliare (Daily Real Estate), a publisher specialised in real estate, offers a timely information and study service in various areas, both through a daily publication (the *QI Online*) and a weekly magazine *"Settimanale QI*". Furthermore, a journal focusing on specific issues is published periodically (*Focus QI*). Many articles deal with the issues of environmental sustainability and energy efficiency in relation to the real estate market.
https://www.ilqi.it/settimanale

2.3.3 Austria

Leitinger in the article named *Energieeffizienz – Umgang in der Bewertung* (2015) published in the Austrian Journal of Property Valuation (**Österreichische Zeitschrift für Liegenschaftsbewertung**) in 2015 pointed out, that EPCs have only been mandatory for a couple of years. The influence of EPCs on the valuation of real estate can therefore only partly be displayed. Nevertheless, the influence of particularly high or low energy costs should be considered in the valuation process.

2.3.4 France

There are several national journals in place in France dealing with real estate.

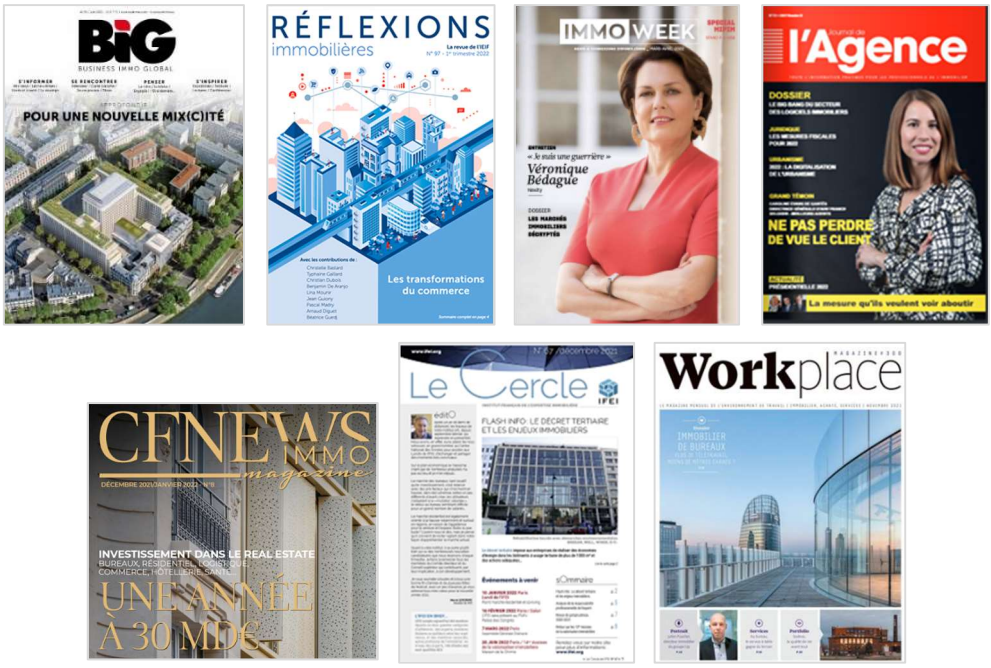

Figure 21: Journals at national level in France

Operations immobilières : real estate monthly magazine of Le Moniteur Group, 10 issues per year, with website exclusive contents, subscription is about 500 € incl. taxes per year.

https://boutique.lemoniteur.fr/les-magazines/operations-immobilieres-revue.html

Business Immo: created in 2004, it is one of the best media of B to B press in real estate sector, with printed journals, website information, video, organisation of events, training, "Lab" , Bi-TV, etc. Mid-2021, they created a new monthly magazine called Business Immo Global or "BiG" , in paper or digital form. One year subscription costs more than 2000 € excl. taxes.

https://www.businessimmo.com

Réflexions immobilières: IEIF journal (Institut de l' Epargne Immobilière et Foncière, institut of real estate and land savings). 2/3 of IEIF members are real estate investors. 4 issues per year.

IMMOWEEK: one-year subscription costs more than 1000 € incl. taxes. Immoweek magazine about 6 times a year. Website with various information, for example "le 13h" every day.

https://www.immoweek.fr/

Journal de l' Agence: journal for real estate agencies + website

https://www.journaldelagence.com

RE-flexions (RE are capital letters): Deloitte magazine, twice a year, in English, downloadable for free.

https://www2.deloitte.com/fr/fr/pages/immobilier/articles/magazine-reflexions.html

CFNEWS Immo: Corporate Finance News Immobilier. Their magazine, with web access, for investors, enterprises and advisors, costs more than 2000 € excl. taxes per year.

https://www.cfnewsimmo.net/

Décideurs magazine (paper): multi-sectors but regularly issues are targeted to real estate decision-makers. They publish 11 issues per year on various topics, plus sectorial guides. For instance, they publish each year a guide on real estate development, construction, and infrastructures (context, interviews, portraits, experts' opinions, rankings of companies). They also have a 2021 guide on Real Estate (market, tendencies, directories and ranking of companies).

About subscription they propose 5 packs, from 169 € incl. taxes, with 11 issues but no guides, until 3599 € incl. taxes, with access to all their guides.

https://www.magazine-decideurs.com/

Le Cercle: magazine of IFEI (Institut Français de l'Expertise immobilière, French Institute of real estate valuation), one or two issues per year, downloadable for free.

With Business Immo, IFEI organise in 2022 the 14th "Assises de la valorisation immobilière" (14th conference on real estate valuation).

Workplace magazine

Together with a website, this magazine is specialised in workplace design, facility management, real estate, targeted at professionals of work environment (mainly office buildings).

Subscription for one year, 7 issues, 96 € incl. taxes.

https://workplacemagazine.fr/calameo

OID Observatoire de l'Immobilier Durable - Sustainable Real Estate Observatory

OID is an independent association with more than 80 members, devoted to sustainable and responsible real estate. It is composed of private and public real estate stakeholders, among them the leaders of French commercial real estate. The OID perimeter includes energy transition, responsible / ESG investment, innovation, and digitalisation.

https://o-immobilierdurable.fr/

TALOEN is a web application developed by OID, which allows access to all the resources and tools from OID dealing with sustainable and responsible (ESG) real estate. They publish barometers, articles, prospective studies, regulation decoding, information on events, guides and tools for responsible approach, and videos. Most of them are free access and some others are reserved to members.

Each year OID publishes the Barometer of energy and environmental performance of buildings. The 2021 barometer, published in January 2022, is based on more than 23 000 buildings representing 54 million m^2 (located in France). The topics are mainly energy and carbon, and in a lesser extent water, waste, resilience to climate change, evolution of reporting regulation. They have also working groups, reserved to members, among them one on Green Value and one on responsible real estate finance.

https://www.taloen.fr/

Radio Immo

This is a radio for real estate actors, dealing with various topics including real estate market and investment.

https://radio.immo/live/1-Radio-immo-fr

2.3.5 Ireland

The Society of Chartered Surveyors Ireland (SCSI) produces for its members with regards to property valuations. However, these reports are only available to society members.

There is an interesting report *Introducing Minimum Energy Efficiency Performance Standards In The Rental Sector – A Review June 2019* representing the Irish Green Building Council staff's interpretation of the workshops' outcomes and feedback. This project has been supported with financial contribution from Sustainable Energy Authority of Ireland under the SEAI Research, Development and Demonstration Funding Programme 2018, Grant number 18/RDD/283.

This short report focuses on the impact of energy performance standards in the Irish rental commercial and residential property market.

Within this report to improve energy efficiency performance the recommendations for both commercial and residential sectors were developed.

The need to link the EPC (known in Ireland as Building Energy Rating - BER) and RTB (Residential Tenancies Board) registers is stressed out, so that landlords can clearly see the value of higher EPC ratings. To encourage better sharing of data between landlords and tenants in the commercial sector, it is suggested to update the Landlord and tenant (amendment) act, 1980 so that new leases and rights to renew leases incorporate green clauses as a basic provision. It is suggested to introduce a minimum energy efficiency standard from 2023 for commercial properties and 2025 for residential properties.

2.3.6 Croatia

The Croatian association of court expert witnesses and valuers publishes in Croatia a journal named Vještak (Witnesses) for its members with regards to property valuations. However, the journal is only available to society members.

2.4 Research analysis, surveys, initiatives, reports, insight papers, and dissertations

Within this chapter the results of the following research analysis / survey / initiatives / reports are presented:

- Research analysis on Environmental, Social and Governance factors for private Real Estate investments published by Allianz Global Investors,
- Research analysis of the impact of LEED certification on market value for in total of 55 office buildings located in the centre of Milan (Italy) published by REbuild Italia in 2018 highlighting the tendency of the Italian real estate market to increasingly recognise the role of sustainability in creating value,
- Survey on Italian real estate market conducted in 2021 focusing on residential real estate market and providing the latest key findings of building energy performance based on the opinion of over 600 surveyed real estate agents throughout the national territory,
- Summary reports published by the French Notaries published in 2015 and 2021 dealing with the green value of the residential sector and showing that green impact is increasing during the period from 2015 to 2021.,
- The Global Real Estate Sustainability Benchmark (GRESB) initiative,
- Report *titled Energy efficiency, the value of buildings and the payment default risk* published by the Joint Research Centre (JRC) in 2018 about the impact of energy efficiency improvements on the value of buildings,
- Insight paper titled *Energy efficiency and residential values: a changing European landscape* from March 2019 Published by the Royal Institution of Chartered Surveyors (RICS) providing an overview of the impact of energy efficiency on the value of residential property (owner-occupied, rented within the private sector or social housing) in Europe.

2.4.1 Research analysis on Environmental, Social and Governance factors materiality for private Real Estate portfolios (2015 - Allianz Global Investors)

The main goal of this research was to determine the impact of Environmental, Social and Governance (ESG) factors for private Real Estate investments. As a first result the research points out that “environmental criteria” such as energy-, water- and waste- efficiency as well as embodied carbon come up as the focus for ESG in Real Estate investments.

To determine the possible impact of Environment on Real Estate value, the research examined several studies across the world (US, UK, Netherlands, Singapore, Japan, Australia) measuring differences in sales prices and rents between green and non-green residential and office buildings. The main outcomes are the following:

- Significant Green Building premia exist. Most studies concluded that green buildings are rewarded with a positive sale and rental premia compared to non-green buildings. The reported figures range up to 17 % (residential sale) and up to 26 % and 12 % (office sale and rent respectively).

- However, the research highlights that sales premium have been decreasing in the past years. This development might be due to increasing awareness and availability of green buildings. Eventually, this might lead to a materialization of so-called brown discounts, i.e., discounts for non-green buildings.
- In general, existence and magnitude of price premia significantly depend on regions, on climate and environmental standards.

Finally, the document specifies some useful "lesson learnt":

- There is a need for greater transparency and consistency of approach to minimise any perceived risks of devaluation or of decreasing expected benefits from the inclusion of sustainability features on building projects.
- The industry needs to gain a better understanding of the implications of changes in the ratio of certified versus non-certified buildings, the trend in legal requirements to upgrade buildings and other external factors related to political, economic, and environmental issues, all of which will impact the asset value of both green and non-green buildings.
- Investors need to understand the implications of climate change and factor this into sustainability risk assessments for the development, ownership, and occupancy of buildings.

2.4.2 Research analysis of impact of LEED certification on market value for office buildings (2018, REbuild-CBRE-GBCI Europe)

The research, focused on 55 large-scale properties (offices) located in the centre of Milan (Italy) and was published in 2018 by REbuild Italia (platform for the innovation of Italian construction sector), in collaboration with CBRE (world leader in consulting real estate) and GBCI Europe (third party that manages the LEED sustainability certification). Data refers to 2009-2018 period.

The research report highlights the tendency of the market to recognise sustainability as a decisive element to guide investment choices and to reward certified properties. From the research, focused on LEED certification, an increase in value emerges between 7 and 11 % of certified properties.

The research report highlights a second aspect: the effect of certification is not limited to a greater enhancement of the assets, but also affects the timing of their marketing. The survey shows a significant improvement in placement times on the property market when the property is certified.

The combined effect of the two effects found in the survey - price increase and faster placement on the market - determines an increase in the return on investment. This is therefore an important signal for investors for whom sustainability is not just a choice in ethics, but an opportunity for superior economic and financial performance.

The research highlights the tendency of the Italian real estate market to increasingly recognise the role of sustainability in creating value. The certification of the building not only has a positive impact in terms of saving energy, water, materials, and resources and reducing waste, but the organizations that occupy these spaces are increasingly verifying their direct benefits in terms of increasing

healthiness and productivity and reduction of staff turnover. Certification thus becomes an element of attraction for investors.

2.4.3 Survey on Italian real estate market conducted in 2021

This survey was carried out by FIAIP (Italian Federation of Real Estate Agents) in collaboration with ENEA (National Agency for New Technologies, Energy and Sustainable Economic Development) and with I-COM (Italian Institute for Competitiveness). The research focuses mainly on residential real estate market (2021 data) and involved over 600 real estate agents throughout the national territory. Among other aspects, it provides some interesting data on the trends in the real estate market with respect to the issue of energy efficiency.

There is a confirmation of the trend, already shown the previous years, of growth in the percentage of sales of new and renovated buildings with higher energy performance classes (A and B): 77 % for new buildings and 32 % for renovated properties.

According to the perception of real estate agents, 60 % of property buyers have a sufficient awareness of the importance of energy efficiency, while only 22 % have an inadequate or insufficient awareness.

Nevertheless, according to the experience of real estate agents, energy performance does not represent a decisive driver in users' choices. The location is the most relevant component in 35,9 % of cases, followed by proximity to transport/services (21,4 %), and typology of property (17 %).

The energy performance of the building is considered decisive only in 8,9 % of cases.

According to the real estate agents' perception, the financial factor is the main obstacle for the buyers to choose an energy efficient property. The motivations are articulated as follow: limited availability of spending (28,7 %), unwillingness to pay a higher cost for benefits that are not clearly measurable (16,8 %), reluctance to pay an immediate extra cost and preference to renovate the property later (15 %).

The lack of trust in the energy labelling system is expressed as motivation by 7 % of the respondents.

A further element concerns the characteristics related to the energy quality of the property that buyers consider more relevant and therefore should be more highlighted in real estate advertisements to attract their interest. Among the main features pointed out we find, in the first places, the presence of high efficiency air conditioning systems (23,3 %), good thermal insulation of structures and fixtures (21,0 %) and renewable source generation plants (17,6 %).

Another interesting data is the relationship between the energy performance class and the location of buildings: in the extreme periphery areas, almost 80 % of the properties sold are in the least performing energy classes (E, F and G), while the percentage of properties in the first energy classes (A and B) is under the 5 %. On the contrary, in the prestigious areas the percentage of properties in the first energy classes (A and B) goes up to 36 %.

The majority of surveyed real estate agents believe that the Energy Performance Certificate (EPC) of a building is a useful tool in orienting the choices of users

towards energy-efficient buildings even if it is considered not so effective in providing information on the major advantages of indoor comfort.

According to the real estate agents, the EPC should be improved to provide more information to buyers useful for orienting their choices towards more energy-efficient buildings.

A significant weakness of the Italian real estate market pointed out by the survey is related to the credit system which is still strongly weak in the establishment of specific credit products to support energy efficiency.

The main reasons behind this weakness selected by real estate agents are:

- the real estate market still does not adequately reflect the added value associated with energy efficiency (45,8 %),
- precautionary attitude of banks that do not accept the cash flows generated by energy savings as main guarantee of the loan (32,9 %),
- lack of adequate tools and technical skills of the banking system to estimate the value of the property in relation to energy efficiency (30,8 %).

It is also interesting to underline the high propensity of the real estate agents interviewed (78 %) to modify the real estate commercial price lists by introducing a "green refurbished" item to provide a quotation for redeveloped properties also from an energy efficiency point of view.

To conclude, the data relating to the impact of the so-called Superbonus 110 % (Italian government incentive providing a 110 % deduction of all expenses incurred for interventions for energy and seismic renovations of buildings) also appear to be very interesting.

Although the measure is recently applied, real estate agents highlight some interesting dynamics triggered by this powerful incentive: more than 35 % of respondents mention a significant positive increase, in both the demand and the supply, of transactions of high energy class buildings.

2.4.4 Summary reports published by the French Notaries

Interesting summary reports have been published for several years by the French Notaries (Notaires de France), dealing with the green value of the residential sector.

For certain acts like land registration, donation, or sale of real estate (apartment, house, land), appealing to a notary is compulsory. Notaries have competencies in determining the value of a property and carrying out a real estate appraisal. Thanks to this activity, French Notaries (Notaires de France) were able to develop a sale transaction database, supplied on a voluntary basis by all the notaries in France. This database is regularly used for publishing analysis of the real estate market (old property sector and new houses market) and since 2012, reports on the green value of residential real estates.

The report published in 2015 was drawn from the sales of old property in France in 2014 (160.000 apartments and 200.000 individual houses). However, EPCs were available for 45 % of the sample. Consequently, the analysis was based on the transaction of 90.000 individual houses and 70.000 apartments. Level D, which is the most widespread, was considered as the reference.

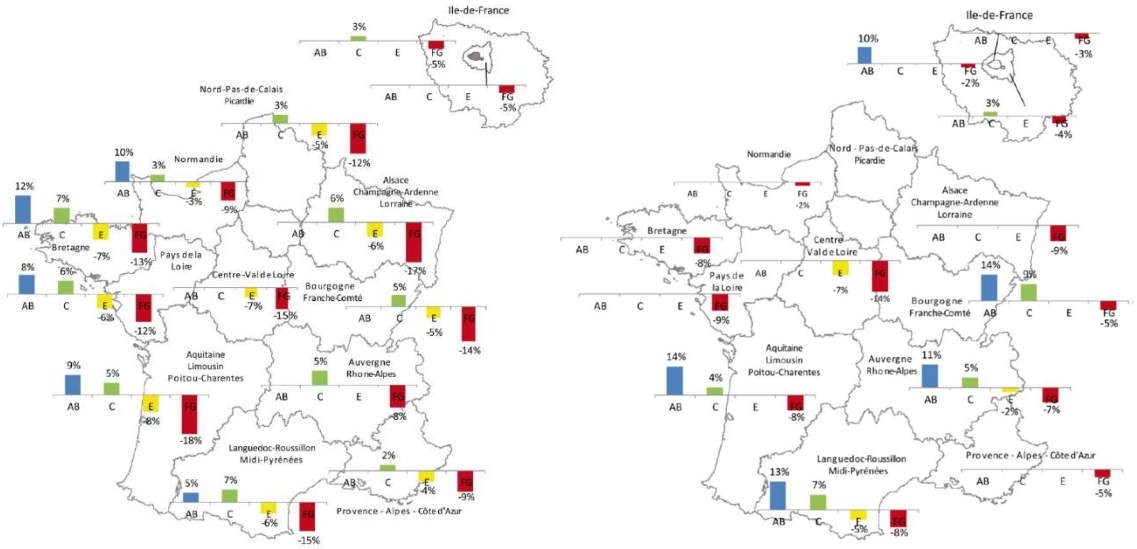

Figure 22: Impact of EPCs on the prices of individual houses (left) and apartment (right) in 2014 in France (Source: Notaires de France, 2015)

The study revealed that the impact of EPCs was smaller for apartments than for individual houses. It also appears that the "brown" discount is stronger than the green premium. Finally, there is a strong regional impact. In area with a high density and a house scarcity, such as the metropolitan area of Paris, the relationship between observed market prices and EPCs is not significant.

The findings in 2021 were different. Figure below shows that EPC influences real estate prices. The brown discount effects were still evident for lower-rated properties (F and G). The gap became even bigger between the reference (D) and apartments rated F and G. This is probably due to a change in the regulation. After August 2022, it will not be possible to increase the rent of housing rated F and G. Renting will even become forbidden in 2025, 2028 and 2034 respectively for G, F and E rated properties.

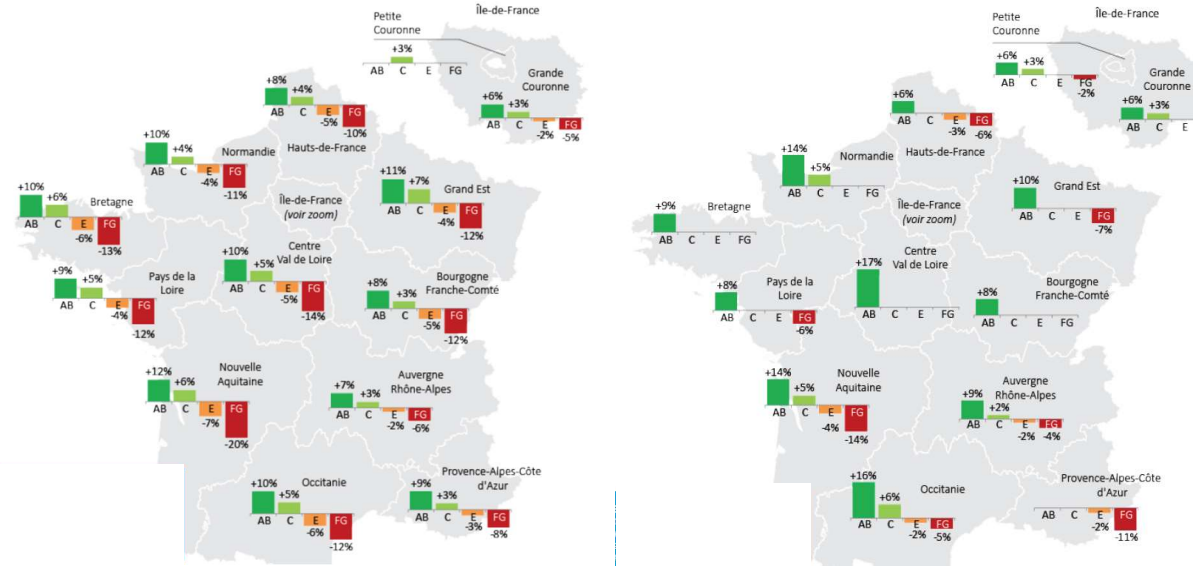

Figure 23: Impact of EPCs on the prices of individual houses (left) and apartment (right) in 2020 in France (Source: Notaires de France, 2021)

The green impact which was limited in 2014 became significant in most regions. Apartments and individual houses rated A and B were frequently sold with a premium except for Paris and Provence-Alpes-Côte d' Azur region. In the Region Nouvelle Aquitaine apartments rated with A or B-obtained a premium of about 12 % while the discount for F and G equals 20 %. On average and for apartments, the premium is 6 % between C and D and the discount limited to 4 % between D and E. Finally, like in 2015, the relationship was stronger for individual houses than for apartments.

2.4.5 The Global Real Estate Sustainability Benchmark (GRESB) initiative

The Global Real Estate Sustainability Benchmark (GRESB) (https://gresb.com/nl-en/) is an industry-driven organization founded in 2009 and committed to assessing the sustainability performance of Real Estate portfolios (public, private and direct) around the globe.

GRESB provides actionable and transparent environmental, social and governance (ESG) data to financial markets with the aim to provide an assessment of ESG performance of Real Estate portfolios that can be used as a benchmark to encourage shifts towards more economically efficient Real Estate investments.

GRESB conducts an annual survey collecting sustainability data from property companies and private funds. The survey includes different sustainability aspects.

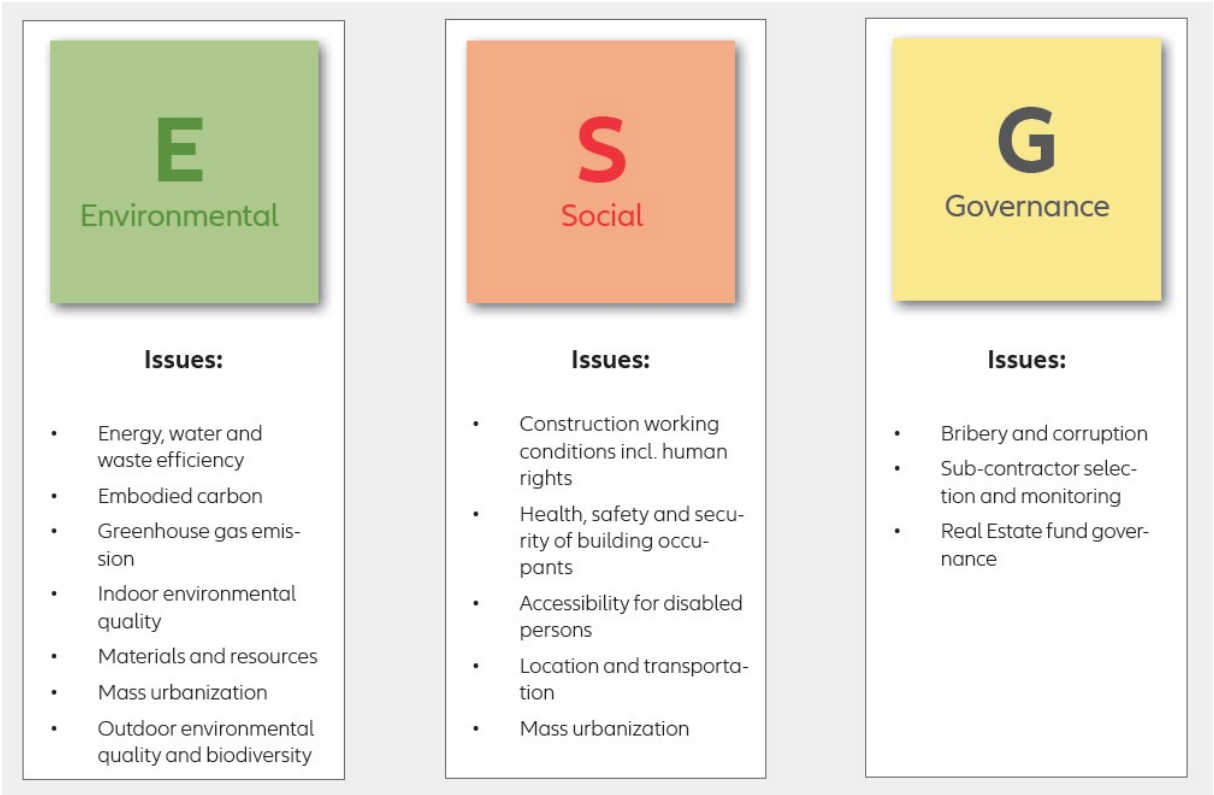

Figure 24: Important ESG Criteria for Real Estate Investments

At the present GRESB is used by more than 140 institutional investors to monitor their investments, engage with their managers, and make informed decisions. They collect, validate, score and benchmark ESG data to provide business intelligence, engagement tools and regulatory reporting solutions for investors, asset managers and the wider industry.

GRESB provides a consistent framework to measure the ESG performance of individual assets and portfolios based on self-reported data. Performance assessments are guided by what investors and the wider industries consider to be material issues, and they are aligned with the Sustainable Development Goals, the Paris Climate Agreement and major international reporting frameworks.

GRESB results provide a practical way to understand ESG performance and communicate it to investors and other stakeholders. GRESB provides overall scores of ESG performance - such as the GRESB Score and GRESB Ratings - as well as detailed aspect-level and individual indicator-level assessments of performance. The key to analysing GRESB data is in peer group comparisons that take into account country, regional, sectoral and investment type variations. This richer analysis enables fund managers and companies to understand their results in the context of their investment strategies and communicate this to their investors.

2.4.6 Joint Research Centre – JRC science for policy reports

A valuable report titled Energy efficiency, the value of buildings and the payment default risk (Zancanella et al.) published by the Joint Research Centre (JRC) in 2018 reviewed at that time current knowledge about the impact of energy efficiency improvements on the value of buildings. In particular, the methodology that can be applied to quantify the increase or decrease of property value linked to the energy performance and sustainability components is explained and different methods are compared.

Main findings within the report:

As a rule of thumb an increase of 3-8 % in the price of residential assets because of energy efficiency improvements, and an increase of around 3-5 % in residential rents compared to similar properties can be observed. For commercial buildings, the premium seems to be higher, over 10 %, and in some studies even over 20 % of sales price increase compared to similar properties has been reported. Rental prices of commercial buildings have also been positively affected by 2-5 %. Differences across regions and countries, as well as different property types (e.g., apartments vs. houses) are shown. A change over time is also seen because the labels and schemes become more well-known and understood. It is shown that higher energy performance is becoming the norm, therefore higher values are associated with better performance in latter times.

Energy efficiency upgrades change the basic characteristics of the buildings affected and thus have an impact on other value drivers: comfort, safety, maintenance, etc. Not only the energy performance, but rather the connotated features can influence the value of a property. Current demand for housing and location are still the main drivers to a building's appraisal value and for a tenant's selection of housing, however energy performance is becoming increasingly important across all reviewed countries.

2.4.7 The Royal Institution of Chartered Surveyors – RICS insight paper

There is one quite interesting insight paper titled *Energy efficiency and residential values: a changing European landscape* from March 2019 Published by the Royal Institution of Chartered Surveyors (RICS). It provides a comprehensive review of the issues that connect values in the residential sector to energy efficiency and provides valuers and other interested stakeholders with an overview of the impact of energy efficiency on the value of residential property (owner-occupied, rented within the private sector or social housing) in Europe.

The following set of recommendations for valuers of residential properties to assist them with considering the impacts of energy efficiency on residential property values is provided:

- recognising and being knowledgeable about the potential impact of climate change on the residential building stock and the consequent need for the majority to be upgraded to meet carbon targets, together with the associated market demand changes and regulatory implications,
- being aware of how buildings' energy efficiency characteristics may lead in some cases to a 'green premium' but also 'brown discounts', or the risk of being 'stranded' in value terms and, where appropriate, advising their clients accordingly as to the risks presented,
- where possible, enhancing their data collection and analysis to provide a firmer basis on which to undertake future valuations and
- working with other professionals as appropriate to develop a more granular knowledge of services and structures that might influence the cost and feasibility of energy retrofits.

It concludes that the evidence points towards energy efficiency beginning to impact on value, though this is a small impact compared with traditional value drivers. Some specific 'visible' characteristics, such as good quality, climate-appropriate glazing, are more important than any certification.

Some barriers to upgrading residential property to improve energy efficiency still exist and are summarised within this insight paper as follows:

- There is no clear business case: the costs of undertaking energy efficiency improvements are not economic in terms of the financial return on investment,
- The split incentive,
- A technological conundrum: common improvements undertaken to achieve higher energy efficiency have not always proved successful
- EPCs do not provide useful decision-making information,
- Data is still an issue,
- Incentives can distort markets.

2.4.8 Impact of HQE certification on the market value of office buildings (Kamelgarn, 2015 – France)

In her Ph.D. thesis, Yona Kamelgarn examined the premium of HQE certification on office buildings (HQE - the French certification for buildings puts energy efficiency, respect for the environment, and the health and comfort of occupiers first).

The survey was based on a sample of 630 buildings. 28 % were certified. Among them, 78 % had been recently built. The average size of certified building was revealed that 19.217 m^2 versus 11.202 m^2 for the rest of the sample. The findings indicated that certified buildings were easier to sale.

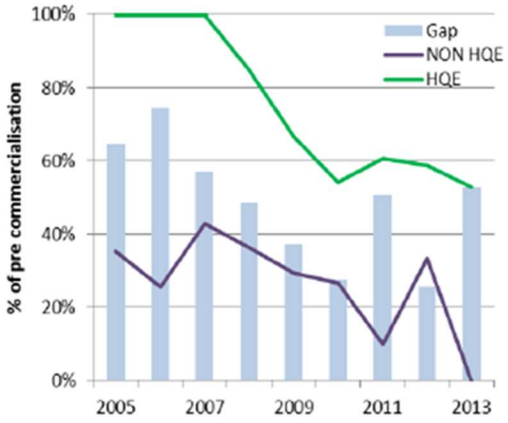

Figure 25: Difference of pre-commercialisation between HQE offices and non-certified buildings (Source: Kamelgarn, 2015)-

Yona Kamelgarn also carried out a survey among corporate real estate managers (60 fully completed the survey) to examine criteria that influences move. The findings pointed out that "environmental label" and "energy performance" ranked last behind "location", "rental level" and "flexibility" (Figure 26).

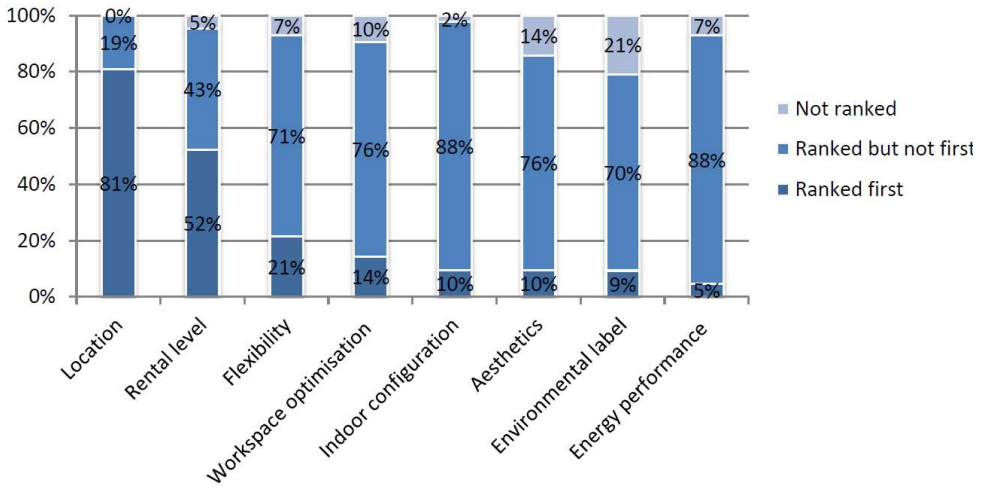

Figure 26: Ranking of move decision criteria (Source: Kamelgarn, 2015)

2.5 Key findings from the conducted literature review

An extensive literature review about the impact of energy efficiency and sustainability features (e.g., EPC rating, sustainability ratings such as BREAM, LEED) on the value of buildings in Europe was conducted.

The conducted literature review identified several European projects (ZEBRA 2020, REVALUE, CA EPBD IV, EeMAP, EeDaPP, ALDREN, LIFE Level(s)), many articles within journals, journals at national levels, conducted research analysis and surveys on real estate market (e.g., Italy), initiatives, reports, and insight papers of various organisations (e.g., French Notaries, GRESB, JRC, RICS) dealing with real estate valuation considering energy efficiency and/or sustainability features.

A survey market analysis among 618 real estate agents form eight countries (Austria, France, Germany, Italy, Norway, Poland, Romania, and Spain) were conducted within the **ZEBRA2020** project, with the main aim to analyse the impact of EPCs on property values and nZEB. At that time (**2016**) main elements considered when selecting, purchasing/leasing real estate were: 1. location, 2. price of the real estate and 3. size of real estate. The energy cost was on the 10th place among all factors. Only real estate agents from Germany stated that there was a cost premium associated with buildings with a high energy performance rating for renting or buying.

According to the final report of **REVALUE** project published in **2019** EPC ratings didn't play a key role in determining values in the residential rented sector, but same visible energy efficiency features such as high-quality glazing were considered. At the end of report, it was concluded that the energy efficiency was certainly beginning to impact value, though at a small scale compared with traditional value drivers (e.g., location).

A survey on Italian real estate market conducted in **2021** among more than 600 real estate agents throughout Italy outlined that financial indicator is the main obstacle for the buyers to choose an energy efficient property.

It is noteworthy that the same obstacle in considering energy efficiency and sustainability when performing real estate valuation is outlined as one of many obstacles when performing a building valuation in several projects, research analyses and reports and is connected to ACCESS TO DATA (limited data availability):

- RICS insight paper (published in March 2019): "*enhancing data collection and analysis to provide a firmer basis on which to undertake future valuations*",
- REVALUE project (final report published in August 2019): "*there is often limited energy data availability*",
- CA EPBD IV (2017): three difficulties were noted, all connected to availability of building related data:
    - "*Access to data, due to national or European data protection laws, especially if the researcher is not the data owner*",
    - "*Availability of EPC data, even if compulsory*",
    - "*Availability of data related to the characteristics identified in the model*".

- "*Availability of the final sales price (rather than the price that the property was advertised at)*".

Table 12 summarises the key findings from the conducted literature review about the impact of energy efficiency and sustainability features on the value of buildings across Europe published in the period from 2011 to 2022 and ordered by publication year.

In most cases price premium is positive and varies across regions and countries and changes over time. A greater surplus for sales transactions that rental transactions has been also confirmed (e.g., analysis performed within the ZEBRA2020 project).

In many studies price premiums for energy-efficient real estate when selling or renting are detected. Some of those studies' results related to price premiums are already obsolete because of changing price premiums with time.

In one summary reports published by the French Notaries it was noted that in a densely populated area (e.g., the metropolitan area of Paris) the relationship between observed market prices and EPCs is not significant.

Despite the detected positive impact of energy efficiency and sustainability features on the value of buildings, it is still not possible to define the relationship between energy efficiency and value of a building due to many dependencies and because the existing price and leases registers do not contain either an EPC label or any other data related to the energy efficiency of a sold building/ building unit.

It can be only stated that the impact of energy efficiency and sustainability features on the value of buildings across Europe is positive.

In accordance with the presented literature, the obtained findings tend to provide evidence on the positive effect of EE investments on a reduction of the default risk and an increase of the property value.

There are many changes across Europe starting on February 24th, 2022. Energy prices have in recent weeks risen to their highest levels in decades. It is of utmost importance to reduce the EU's dependence on imported fossil fuels.

According to the REPowerEU plan published by the European Commission on March 8th, 2022, the key elements of this plan are:

- diversifying supplies (accelerating the upgrade and extension of LNG infrastructure),
- reducing demand,
- ramping up the production of green energy in the EU.

Ramping up renewables and boosting energy efficiency are already the two central pillars of EU energy policy. In the near future, it is expected that Europe will go further and faster in order to reduce GHG emissions and the EU's dependence on imported fossil fuels. This will certainly have a huge impact on the property value too. It is expected that energy efficiency will certainly begin to impact building value at a much wider scale compared with the traditional value drivers. Energy cost will not be in the 10th place among all factors when selecting, purchasing/leasing real estate (results from ZEBRA2020). The use of energy-efficient equipment and integration of renewable energy technologies to reduce energy usage and costs will start to matter influencing stronger the building value.

Table 12: Overview of key findings from conducted literature review – impact of energy efficiency and sustainability on the value of buildings in the European countries

Project / Study/ Author	Publi-cation year	Analysed year or period	EU country	Type of buildings analysed	Number of buildings analysed – sample size	Energy efficiency and sustainability features	IMPACT: √ positive X no impact	Magnitude
Fuerst et al The impact of Energy Performance Certificates on the rental and capital values of commercial property assets	2011		UK	Office, retail, industrial properties	708	EPC, BREEAM	X	The study finds no evidence for significant effects of energy labelling on rental and capital value.
Fuerst et al How does environmental efficiency impact on the rents of commercial offices in the UK?	2015	2006-2010	UK	Office properties	11650	BREEAM	√	BREEAM-certificated buildings command rental premiums from 23-26 %.
Kamelgarn	2015	2005-2013	France	Offices	630	HQE	√	The study indicates that certified buildings were easier to sale.
Notaires de France Summary reports	2015 and 2021	2014 and 2020	France	Housing market (individual houses and apartments)	160.000 in 2014. Not indicated for 2021	EPC rating	√	Impact of EPCs is stronger for individual houses than for apartments. A strong regional influence. Green premium and brown discount are reinforced between 2014 and 2020. On average and for apartments, the premium is 6 % for C over D and the discount is limited to 4 % between D and E.
Chegut et al. Energy efficiency and economic value in affordable housing	2016	2008-2013	Netherlands	Residential	over 17.000	EPC rating	√	an A labelled building was sold with a 6,3 % premium in comparison to similar C rated dwelling. For a B rated dwelling this premium is 2,0 %
De Ayala et al. The price of energy efficiency in the Spanish housing market	2016	–	Spain	Residential	1.507	EPC rating	√	residential buildings labelled A, B or C are valued at a 9,8 % higher price in comparison to D, E, F or G rated homes
Fuerst et al. Does energy efficiency matter to home- buyers? An investigation of EPC ratings and transaction prices in England	2016	1995-2012	England	Residential	over 333.000	EPC rating	√	dwellings with the rating A and B are sold for a premium of 1,8 % over those rated C and a 5 % a premium against D rated dwellings
F. Fuerst et al.	2016	Not available	Wales	Residential	192.000	EPC rating	√	Statistically significant positive price premiums are estimated for dwellings

Project / Study/ Author	Publi-cation year	Analysed year or period	EU country	Type of buildings analysed	Number of buildings analysed – sample size	Energy efficiency and sustainability features	IMPACT: √ positive X no impact	Magnitude
Energy performance ratings and house prices in Wales: An empirical study								in EPC bands A/B (12,8 %) and C (3,5 %) compared to houses in band D. For dwellings in band E (−3,6 %) and F (−6,5 %) there are statistically significant discounts.
Brocklehurst, et al. What will you pay for an" A"?-a review of the impact of building energy efficiency labelling on building value	2017	2013-2016	EU wide	Residential	–	EPC rating	√	a positive correlation between the building's sale value and its EPC rating can be observed all over the EU
Fregonara et al. Energy performance certificates in the Turin real estate market	2017	2011-2014	Turin - Italy	Housing market	879 transactions of old properties	EPC rating	X	EPCs had no impact on transaction prices.
Taltavull et al. Impact of energy performance on transaction prices: Evidence from the apartment market in Bucharest	2017	–	Bucharest	Housing market	–	Retrofitted apartments	√	Green premium in two Bucharest areas between 2,2 and 6,5 %.
Mangialardo, A, et al. Does sustainability affect real estate market values? Empirical evidence from the office buildings market in Milan (Italy)	2018	2009-2018	Italy	Commercial	55	Sustainability certification (LEED)	√	a premium of 7,4 % can obtained with LEED Gold certification and Platinum one with a further positive variation of more than 11 %. Moreover, the study found that buildings with a sustainability certification are rented twice faster than non-certified
REbuild-CBRE-GBCI Europe Impact of LEED certification on market value for office buildings	2018	2009-2018	Italy	Large-scale office	55	LEED certification	√	Increase in market rental values of certified buildings ranging from 7 % to 11 %
Steininger, et al Wahrnehmung des Energieausweises in hypothetischen und realen Mietentscheidungen auf dem deutschen Wohnimmobilienmarkt	2018	2011-2016	Germany	Residential	over 400.000	EPC rating	√	energy-efficient rental properties rated between (A+ to C), are rented with a price premium of 1,5 to 7,1 % over a D rated rental apartments

Project / Study/ Author	Publi-cation year	Analysed year or period	EU country	Type of buildings analysed	Number of buildings analysed – sample size	Energy efficiency and sustainability features	IMPACT: √ positive X no impact	Magnitude
Chegut at al. Energy Efficiency Information and Valuation Practices in Rental Housing	2019	2012	England	Rental housing		EPC rating	X	energy performance does not impact assessed values
		2015					√	a significant discount in assessed values of 0,4 to 1,7% for D-, E- and F-labelled dwellings relative to C-labelled dwellings
		2010	The Netherlands				X	a significant relationship between energy efficiency and assessed values is not observed
		2015					√	more energy efficiency leads to higher external valuations
Fuerst, F., Dalton, B. Gibt es einen wissenschaftlichen Konsens zur Wirtschaftlichkeit nachhaltiger Immobilien	2019	2010-2016	worldwide	Commercial and Residential	65	Sustainability certification	√	A sale price premium of about 7,5 % and rental price premium of 6 % can be observed for sustainably labelled buildings
Heijmans, N. and X. Loncour Impact of the EPC on the property value. Working paper Concerted Action Energy Performance of Buildings	2019	2017	EU wide	Residential	–	EPC rating	√	In most of the EU MSs, a price premium was found for buildings with a high energy performance. The premiums were very different from MS to MS. The sales premium was always higher than the rental premium
Khazal et al. Valuation of energy performance certificates in the rental market – Professionals vs. non professionals	2020	2011–2018	Norway	Residential rental market	440.000	EPC rating	√	Premiums are increasing with higher EPC rating, with 5,1, 6,6 and 6,9 percent higher rents for C-, B- and A-labels, respectively
Mc Cord et al. Energy performance certificates and house prices: a quantile regression approach	2020	2018-2019	Belfast, Northern Ireland	Housing market	1.478 achieved sales transaction	EPC rating	√	The premium is not straightforward. The highest price segments of the B rated energy efficient properties are commanding the premium and the lowest ratings are showing higher 'brown discount' effects.
Veld et al. The Effect of Sustainability on Retail Values, Rents, and Investment Performance: European Evidence	2020	2007-2011	The Netherlands	Retail properties	128	Sustainability rating	X	no evidence of a market premium for sustainable retail properties.

Project / Study/ Author	Publi-cation year	Analysed year or period	EU country	Type of buildings analysed	Number of buildings analysed – sample size	Energy efficiency and sustainability features	IMPACT: √ positive X no impact	Magnitude
Wilkinson and Sayce Decarbonising real estate: the evolving relationship between energy efficiency and housing in Europe	2020	–	Europe	Residential buildings	–	EPC rating	√	Impact of EPCs on market prices. A brown discount is more likely to appear than a green premium.
Addae-Dapaah et al. Green Premium: What is the Implied Prognosis for Sustainability?	2021	2008-2018	England	Office buildings	2.842	BREEAM certification	√	The results of the research show that BREEAM certification commands a rental and price premium of 4,3% and 22,3% respectively
Pommeranz, C., & Steininger, B. I What drives the premium for energy-efficient apartments-green awareness or purchasing power?	2021	2007-2019	Germany	Residential	Over 370.000	EPC rating	√	a 1 % increase in the EPC value (from efficient to inefficient) decreases the rental price by around 2 %.
Olaussen et al. Real Estate Price Formation: Energy Performance Certificates and the Role of Real Estate Agents	2021	2010-2014	Norway	–	390.000	Energy labels	X	Energy labels have low or no impact on transaction prices
Taruttis, L., & Weber, C. Estimating the impact of energy efficiency on housing prices in Germany: Does regional disparity matter?	2022	2014-2018	Germany	Residential	over 420.000	EPC rating	√	If energy efficiency increases by 100 kWh/m²a, prices increase by 6,9 % on average

3 Analysis of specific impacts of labels and certificates

To analyse the specific impact of energy efficiency and sustainability labels/improvements on the value of buildings, expert interviews with real estate agents and valuers in the following project partner countries are conducted: Italy, Austria, France, Ireland, and Croatia.

Despite the effort made by partner from Germany (HM - Hochschule für angewandte Wissenschaften München) to obtain responses to the questionnaire and calling as well as sending the questionnaire to over 30 real estate agents and real estate valuers from all over Germany no one provided HM with their response or agreed to participate in the questionnaire. These observations reflect the lack of interest by real estate agents and real estate valuers in the EPC and sustainability certificate (SC) in general and might point out the marginal role played by the EPC and SC in impacting the real estate value and purchasing decision by prospective customers.

The French partner focused its investigation by interviewing one real estate valuer (see chapter 3.1.2) and a representative of Notaires de France (see chapter 3.2.3.1).

The main objectives of conducting expert interviews are:

- to collect the opinions of real estate agents/valuers about the impact of energy efficiency and sustainability labels on the value of buildings,
  - to find out whether EPC labels have impact on the value of buildings,
  - to find out whether sustainability ratings have impact on the value of buildings,
- to define impact of certain energy efficiency features and different sustainability aspects when performing a building appraisal/valuation,
- to detect real estate agents/valuers' level of trust in the accuracy of EPCs,
- to detect if appraisals/valuations adequately recognise the importance of energy efficiency in each project partner country,
- to detect amendments that real estate agents and valuers would like to have in the next generation EPCs that will be helpful in the building appraisal/valuation process,
- to detect if real estate agents and valuers are informed about the newest proposal for a directive on the energy performance of buildings (EPBD),
- to detect the ranked first five key driver impacting building/appraised value of a building,
- to detect the price premium (in %) for an energy efficient real estate (B rating or better),
- to detect the price premium (in %) for a real estate with a sustainability label,
- to define elements to further raise the impact of the next generation EPCs on the real estate market,
- to extract the opinion of real estate agents/valuers on a number of policies that could foster efficient buildings,
- to detect the five most important factors (key drivers) considered from the buyer/tenant side when buying/renting real estate (factors determine the

buyer/tenant' s choice, but not demonstrate a direct influence on properties value),
- to detect the most important factors from the real estate agent/valuer side when performing real estate valuation,
- to detect all obstacles in considering energy efficiency and sustainability when performing real estate valuation,
- to establish the extent to which valuers consider energy efficiency and sustainability within their valuations,
- to develop understanding of valuers' views on the impact of energy efficiency and sustainability on the value of property.

3.1 Expert interviews with real estate agents and valuers

Real estate agents give the property appraisal. They are not the qualified individuals. They predict the building value based on their experience, previous sales record, and the knowledge of real estate trends in the local area. Also, the property appraisal figures disclosed by the real estate agent is not definitive, authentic and have no legal stand.

Real estate valuers are professionals who estimate the right market value of a building providing the property valuation report (legal document) with accurate value of the property. Valuations are required when a definitive value is needed such as working out family or partnership settlements, establishing the value of a deceased estate, or obtaining finance from a lender. In the case of lenders, they need to ensure the property is a suitable security for a loan and that the market value is enough to cover the mortgage if there was a forced sale.

Since there is a big difference between real estate agents and real estate valuers, two separate online questionnaires (sets of questions) are carefully prepared within EUB SuperHub Consortium using Google Forms.

The following two types of questions are prepared:

- single answer multiple-choice questions (only one option from a list of the already defined answers needs to be selected),
- open-ended questions (descriptive answer is required - it is not the best option for collecting data, based on the answer given by respondent additional person to person discussion is maybe necessary).

All the guiding questions within those two online questionnaires are first written in English and then translated into the national language of each partner country.

One well-known and experienced real estate agent (e.g., director of real estate agency) and one well- experienced and known real estate valuer (director, manager of association of valuers) in each partner country are contacted and kindly asked if they want to share their opinions about the impact of energy efficiency and sustainability on the value of buildings.

Afterwards, to speed up collecting answers from real estate agents and valuers, the links to the online questionnaires prepared using Google Forms are forwarded to them.

After filling out prepared online questionnaires, small expert interviews, mostly related to open-ended questions, are conducted to discuss issues, if necessary,

related to the impact of energy efficiency and sustainability on the building value in each project partner country.

3.1.1 Expert interviews with real estate agents

The authors of the prepared online questionnaire for real estate agents and the EUB SuperHub project partners would like to thank the following real estate agents willing to share their opinions about the impact of energy efficiency and sustainability on the appraised value of buildings:

Italy:	Francesco La Commare	Real Estate Agent & President of the National Study Centre of the FIAIP - Italian Federation of Professional Estate Agents. Vincenzo Campo, Journalist & Head of FIAIP Press Office, contributed to the interview
Austria:	Anton Holzapfel	President of the Austrian Real Estate Association (Österreichischer Verband der Immobilienwirtschaft)
Ireland:	John Tobin	Real estate agent
Croatia:	Martina Mataić Škugor	Licensed real estate agent at real estate agency Opereta

Table 13 gives the results of conducted expert interviews with real estate agents in project partner countries (Italy, Austria, Ireland, and Croatia).

Table 13: Real estate agent interview questions and answers

QUESTIONS FOR REAL ESTATE AGENTS			Italy	Austria	Ireland	Croatia
Name			**Francesco La Commare**	**Anton Holzapfel**	**John Tobin**	**Martina Mataić Škugor**
What is your profile			Real Estate Agent & President of the National Study Centre of the FIAIP (Italian Federation of Professional Estate Agents)	president of the Austrian Real Estate Association (Österreichischer Verband der Immobilienwirtschaft), lobbyist real estate industry	Estate Agent	licensed real estate agent at real estate agency Opereta
1. Do you consider energy efficiency when performing a building appraisal?		No				
		Yes			Yes	Yes
		Other	Yes, but it is still a marginal aspect	is still too seldom considered		
2. Please tick the appropriate box for each of the highlighted energy efficiency features when performing a building appraisal:	EPC rating	No opinion				
		Not important				
		Of little importance		Of little importance		
		Moderately important	Moderately important		Moderately important	
		Very important				Very important
		Not considered				
	Insulation of building envelope	No opinion				
		Not important				
		Of little importance				
		Moderately important		Moderately important	Moderately important	
		Very important	Very important			Very important
		Not considered				
	Age, type, and condition of heating system	No opinion				
		Not important				
		Of little importance				
		Moderately important		Moderately important		Moderately important
		Very important	Very important		Very important	
		Not considered				
	Age, type, and condition of domestic hot water system	No opinion				
		Not important				
		Of little importance				Of little importance
		Moderately important		Moderately important	Moderately important	
		Very important	Very important			
		Not considered				
	Age, type, and condition of cooling/ventilation system (if any)	No opinion				
		Not important				
		Of little importance				Of little importance
		Moderately important	Moderately important	Moderately important	Moderately important	
		Very important				
		Not considered				
	Building automation and control system (BACS)	No opinion				
		Not important				
		Of little importance	Of little importance	Of little importance		Of little importance
		Moderately important			Moderately important	
		Very important				
		Not considered				
	Sources of energy used for building (e.g., fossil fuels or renewables)	No opinion				
		Not important				
		Of little importance		Of little importance		
		Moderately important				
		Very important	Very important		Very important	Very important
		Not considered				
	Calculated&/or measured energy	No opinion				
		Not important				

QUESTIONS FOR REAL ESTATE AGENTS			Italy	Austria	Ireland	Croatia
		Of little importance				
		Moderately important	Moderately important	Moderately important		
		Very important			Very important	Very important
		Not considered				
	Ease of upgrade	No opinion				
		Not important				
		Of little importance		Of little importance		
		Moderately important				Moderately important
		Very important	Very important		Very important	
		Not considered				
	Risk of value decline based on energy assessments	No opinion				
		Not important				
		Of little importance		Of little importance		
		Moderately important				Moderately important
		Very important	Very important		Very important	
		Not considered				
3. What is your level of trust in the accuracy of EPCs?		Distrust				
		Medium trust	Medium trust	Medium trust	Medium trust	Medium trust
		Trust				
		Other				
4. In your opinion, do appraisals adequately recognise the importance of energy efficiency?		No				
		Partly	Partly	Partly	Partly	
		Yes				Yes
		Other				
5. Which amendments would you like to have in EPC, that will be helpful in the building appraisal process?			The contents of the EPC should be made more understandable for the non-expert user	Mandatory information about actual structural-physical weaknesses	Upgrades prior to Introduction of EPC	There are 2 label classes on the first page of EPC in Croatia. Most of non-experts and most of real estate agents don't know the difference between those 2 label classes at all. It seems that EPCs in Croatia are too technical and too complicated to be easily understood by non-experts. CLEAR DESIGN using symbols, logos, drawings is required.
6. Do recommendations for improving the efficiency of EPCs affect the market value of a real estate property?		I don't know / no opinion				
		No	No			No
		Yes			Yes	
		Other		Not enough		
7. Are you:	informed about the newest proposal for a directive on the energy performance of buildings (EPBD) published in December 2021?	No				
		Yes	Yes	Yes	Yes	Yes
	informed about the possible introduction of minimum energy performance standards for existing buildings that would require buildings sold or rented to reach a certain energy efficiency class?	No				
		Yes	Yes	Yes	Yes	Yes
8. Please tick the appropriate box for each of the following aspects on the appraised value of the building when performing an appraisal:	Site - location	No opinion				
		Not important				
		Of little importance				
		Moderately important			Moderately important	
		Very important	Very important	Very important		Very important
		Not considered				

QUESTIONS FOR REAL ESTATE AGENTS			Italy	Austria	Ireland	Croatia
	Infrastructure - transport - services proximity	No opinion				
		Not important				
		Of little importance			Of little importance	
		Moderately important	Moderately important	Moderately important		
		Very important				Very important
		Not considered				
	Building resiliency (extreme weather events, seismic and flood events)	No opinion				
		Not important				
		Of little importance		Of little importance		
		Moderately important			Moderately important	
		Very important	Very important			Very important
		Not considered				
	Devices to reduce water consumption	No opinion				
		Not important				
		Of little importance	Of little importance	Of little importance		Of little importance
		Moderately important			Moderately important	
		Very important				
		Not considered				
	Renewable energy production	No opinion				
		Not important				
		Of little importance	Of little importance	Of little importance		
		Moderately important				Moderately important
		Very important			Very important	
		Not considered				
	Green building materials	No opinion				
		Not important				
		Of little importance		Of little importance		
		Moderately important	Moderately important			Moderately important
		Very important			Very important	
		Not considered				
	Indoor air quality and ventilation	No opinion				
		Not important				
		Of little importance		Of little importance		
		Moderately important	Moderately important			Moderately important
		Very important			Very important	
		Not considered				
	Thermal comfort	No opinion				
		Not important				
		Of little importance		Of little importance		
		Moderately important				Moderately important
		Very important	Very important		Very important	
		Not considered				
	Daylighting sufficiency and visual comfort	No opinion				
		Not important				
		Of little importance		Of little importance		
		Moderately important				Moderately important
		Very important	Very important		Very important	
		Not considered				
	Acoustics comfort	No opinion				
		Not important				
		Of little importance		Of little importance		Of little importance
		Moderately important			Moderately important	
		Very important	Very important			
		Not considered				
		No opinion				

QUESTIONS FOR REAL ESTATE AGENTS			Italy	Austria	Ireland	Croatia
	Accessibility for persons with disabilities	Not important	Not important			
		Of little importance		Of little importance		Of little importance
		Moderately important				
		Very important			Very important	
		Not considered				
	Operating and maintenance cost - life-cycle cost	No opinion				
		Not important				
		Of little importance	Of little importance			
		Moderately important		Moderately important	Moderately important	
		Very important				Very important
		Not considered				
	Broadband communication network	No opinion				
		Not important				
		Of little importance		Of little importance		
		Moderately important				
		Very important	Very important		Very important	Very important
		Not considered				
	Availability and rating of a sustainability assessment certificate	No opinion				
		Not important				
		Of little importance	Of little importance	Of little importance		Of little importance
		Moderately important			Moderately important	
		Very important				
		Not considered				
9. Based on your experience, please rank the five key drivers impacting the appraised value of a building (1 representing the most impactful) (NOTE: you can draw from the tables above)?		1	Transport - Infrastructure	Site - location	Age	Building age
		2	Availability of services	Infrastructure	Location	Building facade
		3	Broadband communication network	Technical building system	Condition	Windows and exterior doors
		4	Energy efficiency	Operational Costs	BER	EPC
		5	Public green	maintenance log	Services	Heating system
10. If it is not within the five key drivers, where do you consider building energy efficiency (EPC rating) impacting the appraisal process? (Enter number)			4	Market value premium or deduction		4
11. From your experience, what is the price premium (in %) for energy efficient real estate (B rating or better)?			It can reach 7-10 %	single digit range	15%	About 10 % (for residential buildings only)
12. From your experience, what is the price premium (in %) for real estate with a sustainability label?			The users are not ready to consider this aspect. When awareness will be greater, it could also reach + 10-15%	single digit range (if even that)	20%	I don't know
13. Can you define elements to further raise the impact of the next generation EPCs on the real estate market?			-make the EPC easier to understand for non-expert users; - include in the EPC information on costs for building renovation interventions and link them to the gain in energy saving	Not the energy certificate, but the customers are the key to success.	Mortgage requirements	EPCs should be less technical, easier to read and display more practical information for consumers.
14. Can you rank the five key drivers the buyer/tenant considers most important when buying/renting real estate (1 representing the most impactful)?		1	Transport - Infrastructure	Site - location	Location	Location
		2	Availability of services	Infrastructure	Age	Ground plan (layout)
		3	Broadband communication network	Technical building system	Condition	Floor
		4	Energy efficiency	Operational costs	BER	Building age
		5	Public green	maintenance log	Broadband	Utility bills
15. From your experience to what extent does the energy efficiency of a residential property influence the decision to rent or buy?		I don't know / no opinion				
		Not important				
		Of little importance		Of little importance		Of little importance
		Moderately important	Moderately important			
		Important			Important	
		Very important				

QUESTIONS FOR REAL ESTATE AGENTS		Italy	Austria	Ireland	Croatia
16. Do higher energy efficiency (B rating and above) rated buildings sell/rent more quickly?	I don’t know / no opinion				
	No	No			No
	Yes			Yes	
	Other		only rarely so far		
17. In your opinion, is summer overheating a criterion that influences the price of a property?	I don’t know / no opinion		I don’t know / no opinion		
	No	No		No	No
	Yes				
	Other				
18. Are green roofs (i.e., roofs that support the growth of vegetation) considered attractive to buyers?	I don’t know / no opinion		I don’t know / no opinion		
	No	No		No	No
	Yes				
	Other				

The results of conducted **expert interviews with real estate agents** in project partner countries (Italy, Austria, Ireland, and Croatia) state that energy efficiency is considered when performing a building appraisal in Ireland and Croatia, whereas in Italy and Austria energy efficiency is still a marginal aspect rarely considered.

1. Do you consider energy efficiency when performing a building appraisal?	Italy	Austria	Ireland	Croatia
No				
Yes			Yes	Yes
Other	Yes, but it is still a marginal aspect	is still too seldom considered		

The second question encompasses ten energy efficiency features. It was required from interviewed real estate agents to tick for their country one of six possible answers (No opinion, Not important, Of little importance, Moderately important, Very important, or Not considered.

Based on the results, EPC rating is very important only in Croatia, moderately important in Italy and Ireland, whereas in Austria EPC rating is of little importance.

Alongside the EPC rating in Croatia, the following energy efficiency features are considered very important too: Insulation of building envelope, Sources of energy used for building, and calculated &/or measured energy.

In Ireland, the following energy efficiency features are considered very important: Age, type, and condition of heating system, Sources of energy used for building, Calculated&/or measured energy, Ease of upgrade, and Risk of value decline based on energy assessments.

Neither of the energy efficiency features in Austria is considered very important.

Interviewed real estate agent in Italy considers the following energy efficiency features very important: Insulation of building envelope, Age, type, and condition of heating system, Age, type, and condition of DHW system, Sources of energy used for building, Ease of upgrade, and Risk of value decline based on energy assessments.

2. Importance of EE features when performing a building appraisal	Italy	Austria	Ireland	Croatia
Of little importance	Building automation and control system (BACS)	**EPC rating** Building automation and control system (BACS) Sources of energy used for building Ease of upgrade Risk of value decline based on energy assessments	–	Age, type, and condition of DHW system Age, type, and condition of cooling/ventilation system Building automation and control system (BACS)
Moderately important	**EPC rating** Age, type, and condition of cooling/ventilation system Calculated&/or measured energy	Insulation of building envelope Age, type, and condition of heating system Age, type, and condition of DHW system Age, type, and condition of cooling/ventilation system Calculated&/or measured energy	**EPC rating** Insulation of building envelope Age, type, and condition of DHW system Age, type, and condition of cooling/ventilation system Building automation and control system (BACS)	Age, type, and condition of heating system Ease of upgrade Risk of value decline based on energy assessments
Very important	Insulation of building envelope Age, type, and condition of heating system Age, type, and condition of DHW system Sources of energy used for building Ease of upgrade Risk of value decline based on energy assessments	–	Age, type, and condition of heating system Sources of energy used for building Calculated&/or measured energy Ease of upgrade Risk of value decline based on energy assessments	**EPC rating** Insulation of building envelope Sources of energy used for building Calculated&/or measured energy

Question related to the trust of real estate agents in the accuracy of EPCs reveals the medium trust of real estate agents in EPCs in all countries involved.

3. What is your level of trust in the accuracy of EPCs?	Italy	Austria	Ireland	Croatia
Distrust				
Medium trust	Medium trust	Medium trust	Medium trust	Medium trust
Trust				
Other				

The fourth question asked was if appraisals adequately recognise the importance of energy efficiency. All interviewed real estate agents confirmed that appraisals only partly recognise the importance of energy efficiency except real estate agent from Croatia.

4. In your opinion, do appraisals adequately recognise the importance of energy efficiency?	Italy	Austria	Ireland	Croatia
No				
Partly	Partly	Partly	Partly	
Yes				Yes
Other				

In the fifth question, the real estate agents were asked to indicate amendments which that will be helpful in the building appraisal process. Real estate agents from Italy and Croatia stated that the content of an EPC is not easy to grasp for non-experts and that an EPC should be more understandable and user friendly.

5. Which amendments would you like to have in EPC, that will be helpful in the building appraisal process?	
Italy	The contents of the EPC should be made more understandable for the non-expert user
Austria	Mandatory information about actual structural-physical weaknesses
Ireland	Upgrades prior to Introduction of EPC
Croatia	There are 2 label classes on the first page of EPC in Croatia. Most of non-experts and most of real estate agents don't know the difference between those 2 label classes at all. It seems that EPCs in Croatia are too technical and too complicated to be easily understood by non-experts. CLEAR DESIGN using symbols, logos, drawings is required.

On the one question related to recommendations for improving the efficiency of EPCs, project partner countries involved gave different answers.

6. Do recommendations for improving the efficiency of EPCs affect the market value of a real estate property?	Italy	Austria	Ireland	Croatia
I don't know / no opinion				
No	No			No
Yes			Yes	
Other		Not enough		

In all project partner countries involved, all interviewed real estate agents are informed about the newest proposal for a directive on the energy performance of buildings (EPBD) published in December 2021. They are all familiar with the possible introduction of minimum energy performance standards for existing buildings requiring buildings sold or rented to reach a particular energy efficiency class.

The eighth question encompasses fourteen features concerning building sustainability. Interviewed real estate agents needed to tick for their country one of

six possible answers (No opinion, Not important, Of little importance, Moderately important, Very important, or Not considered).

Site – location is an essential feature in all project partner countries except Ireland.

In Italy and Croatia, Building resiliency (extreme weather events, seismic and flood events) is also essential. It is not surprising because Italy and Croatia are in active seismic areas, and it is desirable to buy/rent an earthquake-resistant building. After the central part of Croatia was hit in 2020 by the biggest earthquake in the last 140 years in that area, the essential feature asked when buying a building/building unit is the seismic resilience of a building.

A good Broadband communication network became an essential feature in most project partner countries.

Accessibility for persons with disabilities is considered very important in Ireland, whereas in other project partner countries is not important at all (Italy) or is of little importance (Austria, Croatia).

In Italy, comfort (thermal, visual, and acoustics) is essential, whereas comfort in Austria and Croatia is of little importance or moderately important.

It is noteworthy that Renewable energy production, Green building materials, and Indoor air quality and ventilation are considered very important features only in Ireland.

In Austria is Site-location the only feature considered very important.

8. Importance features concerning building sustainability	Italy	Austria	Ireland	Croatia
Not important	Accessibility for persons with disabilities	–	–	–
Of little importance	Devices to reduce water consumption Renewable energy production Operating and maintenance cost - life-cycle cost Availability and rating of a sustainability assessment certificate	Building resiliency Devices to reduce water consumption Renewable energy production Green building materials Indoor air quality and ventilation Thermal comfort Daylighting sufficiency and visual comfort Acoustics comfort Accessibility for persons with disabilities Availability and rating of a sustainability assessment certificate	Infrastructure - transport - services proximity	Devices to reduce water consumption Acoustics comfort Accessibility for persons with disabilities Availability and rating of a sustainability assessment certificate
Moderately important	Infrastructure - transport - services proximity Green building materials Indoor air quality and ventilation	Infrastructure - transport - services proximity Operating and maintenance cost - life-cycle cost	**Site – location** Building resiliency Devices to reduce water consumption Operating and maintenance cost - life-cycle cost Availability and rating of a sustainability assessment certificate	Renewable energy production Green building materials Indoor air quality and ventilation Thermal comfort Daylighting sufficiency and visual comfort
Very important	**Site – location** Building resiliency Thermal comfort Daylighting sufficiency and visual comfort Acoustics comfort Broadband communication network	**Site – location**	Renewable energy production Green building materials Indoor air quality and ventilation Thermal comfort Daylighting sufficiency and visual comfort Accessibility for persons with disabilities Broadband communication network	**Site - location** Infrastructure - transport - services proximity Building resiliency Operating and maintenance cost - life-cycle cost Broadband communication network

In the ninth question, real estate agents ranked the first five key drivers impacting the appraised value of a building. In the first place, in Ireland and Croatia, building age is positioned. Building age is essential in Croatia and connects to the seismic resilience of a building. All buildings built before 1970 are not earthquake-resilient buildings. As already mentioned, location in Austria is of utmost importance followed by infrastructure and technical building system. Transport and infrastructure are first in Italy, followed by the availability of services and broadband communication networks. Energy efficiency is in fourth place in Italy, Ireland, and Croatia (EPC rating is in Ireland named BER – Building Energy Rating).

9. Based on your experience, please rank the five key drivers impacting the appraised value of a building (1 representing the most impactful)	Italy	Austria	Ireland	Croatia
1	**Transport - Infrastructure**	**Site - location**	**Age**	**Building age**
2	Availability of services	Infrastructure	Location	Building facade
3	Broadband communication network	Technical building system	Condition	Windows and exterior doors
4	Energy efficiency	Operational Costs	BER	EPC
5	Public green	Maintenance log	Services	Heating system

Real estate agents in project partner countries indicated a price premium for energy-efficient real estate (B rating or better) in the range of up to 10 %, whereas real estate agent from Ireland indicated a price premium up to 15 %.

11. From your experience, what is the price premium (in %) for energy efficient real estate (B rating or better)?	Italy	Austria	Ireland	Croatia
	It can reach 7-10 %	single digit range	15 %	About 10 %

The price premium for real estate with a sustainability label is up to 20 % in Ireland. In Italy and Croatia, non-expert and simple users are unfamiliar with sustainability aspects.

12. From your experience, what is the price premium (in %) for real estate with a sustainability label?	Italy	Austria	Ireland	Croatia
	The users are not ready to consider this aspect. When awareness will be greater, it could also reach + 10-15%	single digit range (if even that)	20 %	I don’t know

In the thirteenth question, it was required from real estate agents to define elements to raise further the impact of the next generation EPCs on the real estate market. Real estate agents from Italy and Croatia provided the same answer stating that existing EPCs are not easy to grasp for non-experts and should be more understandable and user friendly. A real estate agent from Italy stressed the importance of indicating building renovation costs on an EPC additionally.

13. Can you define elements to further raise the impact of the next generation EPCs on the real estate market?	
Italy	-make the EPC easier to understand for non-expert users - include in the EPC information on costs for building renovation interventions and link them to the gain in energy saving
Austria	Not the energy certificate, but the customers are the key to success.
Ireland	Mortgage requirements
Croatia	EPCs should be less technical, easier to read and display more practical information for consumers.

In the fourteenth question, real estate agents ranked the first five drivers the buyer/tenant considers most important when buying/renting real estate (1 represents the most impactful).

In the first place, in Austria, Ireland and Croatia, the location of a building is positioned. Transport - infrastructure in Italy is of utmost importance for buyers/tenants followed by the availability of services and broadband communication networks.

14. Can you rank the five key drivers the buyer/tenant considers most important when buying/renting real estate (1 representing the most impactful)?	Italy	Austria	Ireland	Croatia
1	Transport - Infrastructure	Site - location	Location	Location
2	Availability of services	Infrastructure	Age	Ground plan (layout)
3	Broadband communication network	Technical building system	Condition	Floor
4	Energy efficiency	Operational costs	BER	Building age
5	Public green	Maintenance log	Broadband	Utility bills

The answers to the fifteenth question vary among project partner countries involved in this task. It seems that only in Ireland energy efficiency of a residential property influences the decision to rent or buy.

15. From your experience to what extent does the energy efficiency of a residential property influence the decision to rent or buy?	Italy	Austria	Ireland	Croatia
I don’t know / no opinion				
Not important				
Of little importance		Of little importance		Of little importance
Moderately important	Moderately important			
Important			Important	
Very important				

Real estate agents were also asked if higher energy efficiency rated buildings sell/rent more quickly. Real estate agents from Italy and Croatia indicated that it was not the case, whereas a real estate agent from Austria noted that it happened only rarely.

16. Do higher energy efficiency (B rating and above) rated buildings sell/rent more quickly?	Italy	Austria	Ireland	Croatia
I don’ t know / no opinion				
No	No			No
Yes			Yes	
Other		only rarely so far		

Most real estate agents noted that summer overheating does not influence property prices.

17. In your opinion, is summer overheating a criterion that influences the price of a property?	Italy	Austria	Ireland	Croatia
I don’t know / no opinion		I don’t know / no opinion		
No	No		No	No
Yes				
Other				

The last question relates to the green roofs. Most real estate agents noted that green roofs are not attractive to buyers.

18. Are green roofs (i.e., roofs that support the growth of vegetation) considered attractive to buyers?	Italy	Austria	Ireland	Croatia
I don’t know / no opinion		I don’t know / no opinion		
No	No		No	No
Yes				
Other				

3.1.2 Expert interviews with real estate valuers

The authors of the prepared online questionnaire for real estate valuers and the EUB SuperHub project partners would like to thank the following real estate valuers willing to share their opinions about the impact of energy efficiency and sustainability on the value of buildings:

Italy:	Antonio Campagnoli,	Responsible for real estate due diligence and advisory division, IsIVI - Italian Institute for Real Estate Valuation
Austria:	Heimo Kranewitter	Generally sworn and judicially certified expert for real estate valuations, editor of the "Zeitschrift für Liegenschaftsbewertung" (Journal of Real Estate Valuation) and author of the book " Liegenschaftsbewertung" , which has become a standard work in Austria
France:	Cédric Perriere	Recognised European Valuer (REV) by TEGoVA Member of the Royal Institution of Chartered Surveyor (MRICS) Vice-President of National Company of real estate valuers
Ireland:	Maurice O'Neill	Valuer – Valuation Office
Croatia:	Melita Bestvina	President of the Croatian association of court expert witnesses and valuers

Table 14 gives the results of conducted expert interviews with real estate valuers in project partner countries (Italy, Austria, France, Ireland, and Croatia).

Table 14: Real estate valuer interview questions and answers

QUESTIONS FOR REAL ESTATE VALUERS			Italy	Austria	France	Ireland	Croatia
Name			**Antonio Campagnoli**	**Heimo Kranewitter**	**Cédric Perriere**	**Maurice O'Neill**	**Melita Bestvina**
What is your profile			Responsible for real estate due diligence and advisory division in IsIVI - Italian Institute for Real Estate Valuation	Real estate valuer	**Recognised European Valuer** (REV) by TEGoVA. Member of the Royal Institution of Chartered Surveyor (MRICS). Works in Nice, one of the main metropolitan areas in France. Market prices are very high and vacancy very low.	Valuer – Valuation Office	- President of the Croatian association of court expert witnesses and valuers - permanent court expert witness and real estate valuer since June 1987 - certified civil engineer and member of the Croatian Chamber of Civil Engineers since 1999 - Judge of the Croatian Chamber of Civil Engineers Disciplinary Court - passed the exam for the REV license (Recognised European Valuer) in TEGoVA
1. Do you consider energy efficiency when performing a building valuation?		No					No
		Yes		Yes	Yes	Yes	
		Other	Yes, but in general energy efficiency still has a marginal role when compared to others key drivers.				
2. Please tick the appropriate box for each of the highlighted energy efficiency features when performing a building valuation:	EPC rating	No opinion					
		Not important					
		Of little importance		Of little importance			
		Moderately important	Moderately important			Moderately important	
		Very important			Very important		
		Not considered					Not considered
	Insulation of building envelope	No opinion					
		Not important					
		Of little importance					
		Moderately important	Moderately important	Moderately important	Moderately important	Moderately important	
		Very important					
		Not considered					Not considered
	Age, type, and condition of heating system	No opinion					
		Not important					
		Of little importance			Of little importance		
		Moderately important	Moderately important			Moderately important	
		Very important		Very important			
		Not considered					Not considered
	Age, type, and condition of domestic hot water system	No opinion					
		Not important					
		Of little importance			Of little importance		
		Moderately important	Moderately important	Moderately important		Moderately important	
		Very important					
		Not considered					Not considered
	Age, type, and condition of cooling/ventilation system (if any)	No opinion					
		Not important					
		Of little importance			Of little importance		
		Moderately important	Moderately important	Moderately important			

QUESTIONS FOR REAL ESTATE VALUERS			Italy	Austria	France	Ireland	Croatia
		Very important				Very important	
		Not considered					Not considered
	Building automation and control system (BACS)	No opinion					
		Not important			Not important		
		Of little importance		Of little importance			
		Moderately important	Moderately important			Moderately important	
		Very important					
		Not considered					Not considered
	Sources of energy used for building (e.g., fossil fuels or renewables)	No opinion					
		Not important					
		Of little importance					
		Moderately important	Moderately important			Moderately important	
		Very important		Very important	Very important		
		Not considered					Not considered
	Calculated&/or measured energy	No opinion					
		Not important					
		Of little importance			Of little importance		
		Moderately important	Moderately important				
		Very important		Very important		Very important	
		Not considered					Not considered
	Ease of upgrade	No opinion					
		Not important					
		Of little importance					
		Moderately important	Moderately important	Moderately important	Moderately important		
		Very important				Very important	
		Not considered					Not considered
	Risk of value decline based on energy assessments	No opinion					
		Not important					
		Of little importance					
		Moderately important	Moderately important	Moderately important			
		Very important			Very important	Very important	
		Not considered					Not considered
3. What is your level of trust in the accuracy of EPCs?		Distrust		Distrust			
		Medium trust	Medium trust		Medium trust	Medium trust	
		Trust					
		Other					It depends on who made it. How to have trust in the accuracy of EPC issued by “Black Egg” at a price of 350-500 kn?
4. In your opinion, do valuations adequately recogn~~ize~~ise the importance of energy efficiency?		No			No		No
		Partly	Partly	Partly		Partly	
		Yes					
		Other					
5. Which amendments would you like to have in EPC, that will be helpful in the building valuation process?			Including in the EPC clear quantitative data on the annual energy costs savings that could be obtained in relation to different kind of interventions to improve	No amendments necessary, it’ s ok in general, if the correctness of the results can be guaranteed	Consumption historical data of the property Accurate cost/audit for energy efficiency	BER certification in Ireland is very basic, particularly for non-residential properties	There is no need to change regulations related to energy efficiency in Croatia, but there is an urgent need to bring changes to the regulations related to Real estate valuation act

QUESTIONS FOR REAL ESTATE VALUERS			Italy	Austria	France	Ireland	Croatia
			energy performance level of the property				in Croatia. The regulations must consider EE. Also, one feature not considered at the moment is healthy indoor climate conditions required by the 2009 World Health Organisation guidelines.
6. Do recommendations for improving the efficiency of EPCs affect the market value of a real estate property?		I don’ t know / no opinion				I don’t know/no opinion	
		No					No
		Yes			Yes		
		Other	Not currently	Rather circumstantial for the price evaluation, the market value depends mostly on the location			
7. Are you:	informed about the newest proposal for a directive on the energy performance of buildings (EPBD) published in December 2021?	No					
		Yes	Yes	Yes	Yes	Yes	Yes
	aware of a possible legal obligation to renovate existing building to a higher level of energy efficiency by a fixed date or at a certain inflection point (e.g., rental, sale), which creates unavoidable major cost that impact Market Value?	No					
		Yes	Yes	Yes	Yes	Yes	Yes
8. Please tick the appropriate box for each of the following aspects on market value when performing a building valuation:	Site - location	No opinion					
		Not important					
		Of little importance					
		Moderately important					
		Very important	Very important	Very important	Very important	Very important	Very important
		Not considered					
	Infrastructure - transport - services proximity	No opinion					
		Not important					
		Of little importance					
		Moderately important					
		Very important	Very important	Very important	Very important	Very important	Very important
		Not considered					
	Building resiliency (extreme weather events, seismic and flood events)	No opinion					
		Not important					
		Of little importance			Of little importance		
		Moderately important		Moderately important			
		Very important	Very important			Very important	Very important
		Not considered					
	Devices to reduce water consumption	No opinion					
		Not important			Not important		
		Of little importance		Of little importance		Of little importance	
		Moderately important	Moderately important				
		Very important					
		Not considered					Not considered
	Renewable energy production	No opinion					
		Not important					

QUESTIONS FOR REAL ESTATE VALUERS			Italy	Austria	France	Ireland	Croatia
		Of little importance				Of little importance	
		Moderately important	Moderately important	Moderately important	Moderately important		
		Very important					
		Not considered					Not considered
	Green building materials	No opinion					
		Not important			Not important		
		Of little importance				Of little importance	
		Moderately important	Moderately important	Moderately important			
		Very important					
		Not considered					Not considered
	Indoor air quality and ventilation	No opinion					
		Not important			Not important		
		Of little importance				Of little importance	
		Moderately important		Moderately important			
		Very important	Very important				
		Not considered					Not considered
	Thermal comfort	No opinion					
		Not important			Not important		
		Of little importance				Of little importance	
		Moderately important					
		Very important	Very important	Very important			
		Not considered					Not considered
	Daylighting sufficiency and visual comfort	No opinion					
		Not important					
		Of little importance					
		Moderately important			Moderately important	Moderately important	
		Very important	Very important	Very important			Very important
		Not considered					
	Acoustics comfort	No opinion					
		Not important					
		Of little importance					
		Moderately important			Moderately important	Moderately important	
		Very important	Very important	Very important			Very important
		Not considered					
	Accessibility for persons with disabilities	No opinion					
		Not important					
		Of little importance			Of little importance		
		Moderately important		Moderately important		Moderately important	
		Very important	Very important				
		Not considered					Not considered
	Operating and maintenance cost - life-cycle cost	No opinion					
		Not important					
		Of little importance					
		Moderately important	Moderately important		Moderately important	Moderately important	
		Very important		Very important			Very important
		Not considered					
	Broadband communication network	No opinion					
		Not important					
		Of little importance					
		Moderately important		Moderately important	Moderately important	Moderately important	
		Very important	Very important				
		Not considered					Not considered
		No opinion					

QUESTIONS FOR REAL ESTATE VALUERS			Italy	Austria	France	Ireland	Croatia
	Availability and rating of a sustainability assessment certificate	Not important					
		Of little importance		Of little importance			
		Moderately important	Moderately important		Moderately important		
		Very important				Very important	
		Not considered					Not considered
9. Based on your experience, please rank the five key drivers impacting building value (1 representing the most impactful) (NOTE: you can draw from the tables above)?		1	Indoor comfort	Site - location	Location/Environment/View	Location	Site - location
		2	Site-location	Third party usability	Building type and construction quality	Fit for purpose	Building-earthquake resilience
		3	Transport and services proximity	Building age	Transportation/Infrastructure	Age and condition	Functionality (plot, number of rooms, floor number, elevator)
		4	Building resiliency	Construction of the building	Interior state and annexes	Connectivity	Sustainable building service life
		5	EPC rating	Technical facilities	Maintenance cost and taxes	Planning and zoning	positive characteristics of real estate such as visual and acoustic comfort, building orientation, insolation, distance to surrounding buildings
10. If it is not within the five key drivers, where do you consider building energy efficiency (EPC rating) impacting building value? (Enter number)			/	Energy efficiency has an impact on the real estate value, however it is only one out of many parameters. The fundamental driver is the location.	6	6	At the moment energy efficiency is not considered at all within Croatian regulations related to property valuation (Real estate valuation act (Official Gazette 78/2015), Ordinance on real estate valuation methods (Official Gazette No 79/2014)), although energy efficiency has been integrated into the European valuation standards published by TEGoVA since 2012
11. From your experience, what is the price premium (in %) for energy efficient real estate (B rating or better)?			Difficult to quantify at present	In most cases rather a side issue und thus no significant price premium can be determined	5 - 10 %	not directly applicable for commercial properties	–
12. From your experience, what is the price premium (in %) for real estate with a sustainability label?			It varies according to the type of building and the rating system used	The U.S. Green Building Council has detected a 7.5 percent appreciation potential in 2008.	10 %	Depends on the label and grading, as well as the property class	–
13. Can you define elements to further raise the impact of the next generation EPCs on the real estate market?			Next generation EPCs should be conceived and used not only as an administrative/technical document, but as a management tool to give continuous indications	The reliability of the EPC should be improved, since many market participants doubt the correctness of the results. If the costs for the issue of an EPC start from €	No opinion	Not clear as to what is being requested	There is an urgent need to bring changes to the regulations related to Real estate valuation in Croatia (Real estate valuation act (Official Gazette 78/2015), Ordinance on real estate

QUESTIONS FOR REAL ESTATE VALUERS	Italy	Austria	France	Ireland	Croatia
	and suggestions to the end user.	100,00, this is not reliable.			valuation methods (Official Gazette No 79/2014)). Also, I think that is necessary to introduce a so-called energy card for each real estate property (e.g., single-family house, apartment, office, ...). Without that energy card, it would not be possible to use / sell / rent any real estate property.

The expert interviews with real estate valuers in project partner countries (Italy, Austria, France, Ireland, and Croatia) state that real estate valuers in Italy, Austria, France, and Ireland consider energy efficiency when performing a building valuation. However, the role of energy efficiency in Italy is marginal compared to other key drivers. Real estate valuers in Croatia do not consider energy efficiency when performing a building valuation.

1. Do you consider energy efficiency when performing a building valuation?	Italy	Austria	France	Ireland	Croatia
No					No
Yes		Yes	Yes	Yes	
Other	Yes, but in general energy efficiency still has a marginal role when compared to others key drivers.				

The second question encompasses ten energy efficiency features. It was required from interviewed real estate valuers to tick for their country one of six possible answers (No opinion, Not important, Of little importance, Moderately important, Very important, or Not considered).

Interviewed real estate valuer from Italy considers all listed energy efficiency features moderately important when performing a building valuation.

In Austria, interviewed energy valuer consider the following three energy efficiency features very important:

- Age, type, and condition of heating system,
- Sources of energy used for building,
- Calculated&/or measured energy.

In France, interviewed energy valuer consider the following three energy efficiency features very important:

- EPC rating,
- Sources of energy used for building,
- Risk of value decline based on energy assessments.

In Ireland, interviewed energy valuer consider the following three energy efficiency features very important:

- Age, type, and condition of cooling/ventilation system (if any)
- Calculated&/or measured energy
- Ease of upgrade
- Risk of value decline based on energy assessments

Interviewed real estate valuer from Croatia stated that real estate valuers in Croatia do not consider energy efficiency when performing a building valuation at all. The real estate valuation act (Official Gazette 78/2015) does not prescribe the importance of energy efficiency when performing a building valuation. The entire real estate valuation act does not even mention energy efficiency.

It is noteworthy, that the EPC rating is very important in France, moderately important in Italy and Ireland and of little importance in Austria.

2. Importance of EE features when performing a building valuation	Italy	Austria	France	Ireland	Croatia
Not important	–		Building automation and control system (BACS)	–	–
Of little importance	–	**EPC rating** Building automation and control system (BACS)	Age, type, and condition of heating system Age, type, and condition of DHW system Age, type, and condition of cooling/ventilation system Calculated&/or measured energy	–	–
Moderately important	**EPC rating** Insulation of building envelope Age, type, and condition of heating system Age, type, and condition of DHW system Age, type, and condition of cooling/ventilation system Building automation and control system (BACS) Sources of energy used for building Calculated&/or measured energy Ease of upgrade Risk of value decline based on energy assessments	Insulation of building envelope Age, type, and condition of DHW system Age, type, and condition of cooling/ventilation system Ease of upgrade Risk of value decline based on energy assessments	Insulation of building envelope Ease of upgrade	**EPC rating** Insulation of building envelope Age, type, and condition of heating system Age, type, and condition of DHW system Building automation and control system (BACS) Sources of energy used for building	–
Very important	–	Age, type, and condition of heating system Sources of energy used for building Calculated&/or measured energy	**EPC rating** Sources of energy used for building Risk of value decline based on energy assessments	Age, type, and condition of cooling/ventilation system Calculated&/or measured energy Ease of upgrade Risk of value decline based on energy assessments	–

Question related to the trust of real estate valuers in the accuracy of EPCs reveals the medium trust of real estate valuers in EPCs in Italy, France and Ireland, and distrust in Austria and Croatia. Interviewed real estate valuer in Croatia stressed the problem of low prices for issuing an EPC in Croatia. She doesn't trust all energy assessors.

3. What is your level of trust in the accuracy of EPCs?	Italy	Austria	France	Ireland	Croatia
Distrust		Distrust			
Medium trust	Medium trust		Medium trust	Medium trust	
Trust					
Other					It depends on who made it. How to have trust in the accuracy of EPC issued by " Black Egg" at a price of 350-500 kn?

The fourth question asked was if valuations adequately recognise the importance of energy efficiency. All interviewed real estate valuers confirmed that valuations only partly recognise the importance of energy efficiency except in France and Croatia. Real estate valuers in Croatia do not consider energy efficiency when performing a building valuation at all.

4. In your opinion, do valuations adequately recognise the importance of energy efficiency?	Italy	Austria	France	Ireland	Croatia
No			No		No
Partly	Partly	Partly		Partly	
Yes					
Other					

In the fifth question, the real estate valuers were asked to indicate amendments which that will be helpful in the building valuation process.

Interviewed real estate valuer from Italy thinks that clear quantitative data on the annual energy costs savings should be included within an EPC.

A real estate valuer from Austria stated that no amendments are necessary. He finds more important correctness of the results encompassed by EPC.

A real estate valuer from France indicated the historical consumption data and accurate cost/audit for energy efficiency as essential amendments.

A real estate valuer from Ireland emphasised that BER certification in Ireland is very basic intended particularly for non-residential buildings.

A real estate valuer from Croatia emphasised an urgent need to consider energy efficiency within the existing Real estate valuation act (Official Gazette 78/2015).

5. Which amendments would you like to have in EPC, that will be helpful in the building valuation process?	
Italy	Including in the EPC clear quantitative data on the annual energy costs savings that could be obtained in relation to different kind of interventions to improve energy performance level of the property
Austria	No amendments necessary, it’ s ok in general, if the correctness of the results can be guaranteed
France	Consumption historical data of the property Accurate cost/audit for energy efficiency
Ireland	BER certification in Ireland is very basic, particularly for non-residential properties
Croatia	There is no need to change regulations related to energy efficiency in Croatia, but there is an urgent need to bring changes to the regulations related to Real estate valuation act in Croatia. The regulations must consider EE. Also, one feature not considered at the moment is healthy indoor climate conditions required by the 2009 World Health Organisation guidelines.

On the one question related to recommendations for improving the efficiency of EPCs, project partner countries involved gave negative answers stating that recommendations for improving energy efficiency do not affect the market value of a real estate property. Only a real estate valuer from France indicated a positive answer.

6. Do recommendations for improving the efficiency of EPCs affect the market value of a real estate property?	Italy	Austria	France	Ireland	Croatia
I don’t know / no opinion				I don’t know/no opinion	
No					No
Yes			Yes		
Other	Not currently	Rather circumstantial for the price evaluation, the market value depends mostly on the location			

In all project partner countries involved, all interviewed real estate valuers are informed about the newest proposal for a directive on the energy performance of buildings (EPBD) published in December 2021. They are all familiar with the possible introduction of minimum energy performance standards for existing buildings requiring buildings sold or rented to reach a particular energy efficiency class.

The eighth question encompasses fourteen features concerning building sustainability. Interviewed real estate agents needed to tick for their country one of six possible answers (No opinion, Not important, Of little importance, Moderately important, Very important, or Not considered).

The table below summarises the importance of features concerning building sustainability across project partner countries involved.

All real estate valuers consider the following two sustainability features essential when performing a building valuation:

- Site - location, and
- Infrastructure - transport - services proximity.

Building resiliency is also very important in all countries except Austria.

Alongside location, infrastructure and building resiliency, the following sustainability features are also very important in Italy:

- Indoor air quality and ventilation
- Comfort (thermal, acoustics, visual)
- Daylighting sufficiency
- Accessibility for persons with disabilities
- Broadband communication network

Surprisingly, the following three features are moderately important (Italy), of little importance (Ireland) or not considered at all (Croatia):

- Devices to reduce water consumption,
- Renewable energy production,
- Green building materials.

Real estate valuers in Croatia do not consider many sustainability features when performing a building valuation.

8. Importance of features concerning building sustainability	Italy	Austria	France	Ireland	Croatia
Not important	–	–	Devices to reduce water consumption Green building materials Indoor air quality and ventilation Thermal comfort	–	–
Of little importance	–	Devices to reduce water consumption Availability and rating of a sustainability assessment certificate	Building resiliency Accessibility for persons with disabilities	Devices to reduce water consumption Renewable energy production Green building materials Indoor air quality and ventilation Thermal comfort	–
Moderately important	Devices to reduce water consumption Renewable energy production Green building materials Operating and maintenance cost - life-cycle cost Availability and rating of a sustainability assessment certificate	Building resiliency Renewable energy production Green building materials Indoor air quality and ventilation Accessibility for persons with disabilities Broadband communication network	Renewable energy production Daylighting sufficiency and visual comfort Acoustics comfort Operating and maintenance cost - life-cycle cost Broadband communication network Availability and rating of a sustainability assessment certificate	Daylighting sufficiency and visual comfort Acoustics comfort Accessibility for persons with disabilities Operating and maintenance cost - life-cycle cost Broadband communication network	–
Very important	**Site - location** Infrastructure - transport - services proximity Building resiliency Indoor air quality and ventilation Thermal comfort	**Site - location** Infrastructure - transport - services proximity Thermal comfort Daylighting sufficiency and visual comfort Acoustics comfort	**Site – location** Infrastructure - transport - services proximity	**Site - location** Infrastructure - transport - services proximity Building resiliency Availability and rating of a sustainability assessment certificate	**Site - location** Infrastructure - transport - services proximity Building resiliency Daylighting sufficiency and visual comfort Acoustics comfort

8. Importance of features concerning building sustainability	Italy	Austria	France	Ireland	Croatia
	Daylighting sufficiency and visual comfort Acoustics comfort Accessibility for persons with disabilities Broadband communication network	Operating and maintenance cost - life-cycle cost			Operating and maintenance cost - life-cycle cost
Not considered	–	–	–	–	Devices to reduce water consumption Renewable energy production Green building materials Indoor air quality and ventilation Thermal comfort Accessibility for persons with disabilities Broadband communication network Availability and rating of a sustainability assessment certificate

In the ninth question, real estate valuers ranked the first five key drivers impacting building value. In the first place, in all countries except Italy, site-location is positioned.

9. Based on your experience, please rank the five key drivers impacting building value (1 representing the most impactful)	Italy	Austria	France	Ireland	Croatia
1	Indoor comfort	**Site - location**	**Location/Environment/View**	**Location**	**Site - location**
2	**Site-location**	Third party usability	Building type and construction quality	Fit for purpose	Building-earthquake resilience
3	Transport and services proximity	Building age	Transportation/Infrastructure	Age and condition	Functionality (plot, number of rooms, floor number, elevator)
4	Building resiliency	Construction of the building	Interior state and annexes	Connectivity	Sustainable building service life
5	EPC rating	Technical facilities	Maintenance cost and taxes	Planning and zoning	positive characteristics of real estate such as visual and acoustic comfort, building orientation, insolation, distance to surrounding buildings

Interviewed real estate valuers did not provide appropriate answers to questions about a price premium for energy-efficient real estate or for real estate with sustainability labels (questions number 11 and 12).

In the last thirteenth question, it was required from real estate valuers to define elements to raise further the impact of the next generation EPCs on the real estate market.

A real estate valuer from Italy stated that next-generation EPCs should be conceived and used not only as an administrative/technical document, but as a management tool to give continuous indications and suggestions to the end user.

A real estate valuer from Austria was more concerned about the reliability of EPCs, stressing the importance of improving the reliability of EPCs. He also commented that he doesn't consider EPCs whose costs of issuing is around €100,00 reliable.

A real estate valuer from Croatia concluded this interview by stressing the importance of bringing changes to the regulations related to Real estate valuation in Croatia so that real estate valuers in Croatia could start taking EE and SC features into account when performing a building valuation.

13. Can you define elements to further raise the impact of the next generation EPCs on the real estate market?	
Italy	Next generation EPCs should be conceived and used not only as an administrative/technical document, but as a management tool to give continuous indications and suggestions to the end user.
Austria	The reliability of the EPC should be improved, since many market participants doubt the correctness of the results. If the costs for the issue of an EPC start from €100,00, this is not reliable.
France	No opinion
Ireland	Not clear as to what is being requested
Croatia	There is an urgent need to bring changes to the regulations related to Real estate valuation in Croatia (Real estate valuation act (Official Gazette 78/2015), Ordinance on real estate valuation methods (Official Gazette No 79/2014)). Also, I think that is necessary to introduce a so-called energy card for each real estate property (e.g., single-family house, apartment, office, ...). Without that energy card, it would not be possible to use / sell / rent any real estate property.

3.2 Key findings from conducted expert interviews with real estate agents and valuers

After filling out prepared online questionnaires, small expert interviews, mostly related to open-ended questions, were conducted to discuss issues related to the impact of energy efficiency and sustainability on the building value in each project partner country. The text below gives the results of those discussions.

3.2.1 Italy

3.2.1.1 Real estate agent

The interview in Italy involved Francesco La Commare, Real Estate Agent & President of the National Study Centre of the FIAIP and Vincenzo Campo, Journalist & Head of FIAIP Press Office. Below are summarised the main elements that emerged from the interview.

Energy efficiency is considered, to date in Italy, still a marginal element in real estate valuations.

The building valuation report used by the real estate agent does not have a chapter dedicated to energy performance area and the real estate agents, on average, do not have the technical skills necessary to properly use the information provided by the EPC.

FIAIP representative recommends that the UNI Standard 11558 - 2014, defining the requirements of knowledge and skills of the real estate appraiser, should be revisited, and updated to include minimum technical competence to be provided to the real estate agents on building's energy performance analysis.

In Italy, the EPC is mandatory for any real estate transaction. As pointed out by the FIAIP Survey on the Italian real estate market carried out in 2020, the 55 % of the interviewed agents considers EPC a fundamental tool. Although aware of the importance of this document, in general, data provided by the EPC are difficult to be understood by the real estate agents and normally they are not used to require the support of third-party external experts to analyse technical data in EPC.

FIAIP representative recommends making the EPC data less technical and easier to understand and use for the real estate agents and for the end users. Furthermore, the EPC can be improved by highlighting the economic benefits that the user can obtain: it should point out clearly how the cost of the investment for improving building energy performance can be recovered over a certain number of years.

Currently, the Italian EPC already contains a section that provides recommendations on interventions to improve the energy class, but it does not quantify the cost of the interventions and the annual energy savings that each intervention would generate and is therefore not useful for the end user.

The EPC should quantify and show clearly the "annual cost savings" obtained with different types of financial investments for improving building energy efficiency. Different time scenarios to reach the break-even point should be provided to the end user too.

Furthermore, the EPC should include a clear indication of the reduction of the carbon footprint in relation to different energy efficiency interventions.

The knowledge of the new directive on the energy performance of buildings (EPBD) published in December 2021 is not so widespread among real estate agents.

FIAIP representative recommends that European legislation should consider carefully social and economic aspects. Especially in certain social contexts (for example suburban neighbourhoods), to intervene only with coercive legislative regulations, could not be enough, as energy and environmental sustainability are issues not understood by the end user. It should be necessary to intervene on culture and awareness so that the citizen metabolizes these needs. To promote widespread communication campaigns among citizens is advisable.

The location of the building, its exposure and view have a significant weight on the buyer's choice. Other elements that are acquiring ever greater importance are the presence of transport infrastructures and the availability of digital infrastructures (broadband connection). Indoor comfort (thermal, acoustic) is also a very important element and attention to this element has increased a lot due to COVID restrictions as smart working makes people spend more time at home making them more attentive to indoor quality.

The 110 % incentive currently applied in Italy (Ecobonus), is contributing partially to raise awareness of building buyers on energy consumption reduction and sustainability issues, but it is still considered more as an opportunity to reduce building renovation costs.

In terms of awareness, the younger generations of real estate agents, as well as property buyers, demonstrate greater sensitivity and awareness regarding the issues of energy and environmental sustainability.

To increase public awareness on the issues of decarbonization and energy waste reduction is considered by the FIAIP representative an important aspect.

3.2.1.2 Real estate valuer

The interview in Italy involved Antonio Campagnoli, Responsible for real estate due diligence and advisory division, IsIVI - Italian Institute for Real Estate Valuation. Below are summarised the main elements that emerged from the interview.

Based on IsIVI experience in the Italian real estate market, the weight of the building's energy performance in properties estimation has been gradually growing in recent years. However, it still plays a marginal role when compared to other key drivers, above all for residential buildings.

IsIVI is actively working to make energy efficiency a more relevant element in defining the value of a property. Among other things, as active member of TEgOVA association, in 2021 IsIVI translated the TEgOVA Standards (EVS 2020), into Italian, and is contributing to disseminate them among the concerned operators.

Certainly, the financial incentives currently available in Italy for buildings renovation (Ecobonus 110 %) play a fundamental role in increasing public awareness and speeding up the transition of real estate assets towards better energy performances.

The valuer's appraisal surely considers the expected energy consumption of the property. There are differences in estimating the impact of energy efficiency between new and existing buildings. New buildings, having proved and certificated high energy performance, have significantly higher market values, but energy aspect is considered together with many other elements. For existing buildings, a higher level of energy efficiency certified by the EPC is not always adequately recognised in the appraisal process and has marginal impact on the increase of property value.

IsIVI representative recommends integrating the EPC to provide the end user with quantitative indications on the annual energy costs savings that can be obtained in relation to the improvement of energy performance level of the property. The EPC should include simulation of "energy costs saving scenarios" in relation to different applicable building renovation works and this information would make the end user aware of the benefits achieved in buying a more energy performant property. Furthermore, this quantitative "energy costs savings" indication on the EPC could be used by the valuer to quantify and apply the corresponding increase in property value.

At the present, EPC is still too often regarded only as an administrative document, to be used for formal purposes. The energy performance analysis is done in EPC in a very rigid way, and it is strictly linked to the structural features of the property.

IsIVI representative suggests that new generation EPC should be conceived and used as a management tool to give continuous indications and suggestions to the end user. The buyer/ tenant should also find practical indications in the EPC on how to operationally manage the property and what interventions should be carried out in the future to maintain or increase the current energy performance level of the property.

Regarding the impact on building appraisal of environmental sustainability certificates, IsIVI representative highlights how in Italy the real estate market rewards the environmental rating and certification systems which, like LEED, have conducted significant and widespread promotional and marketing campaigns in recent years and are therefore recognised more easily by the end user. It is mainly a matter of "label image", independently by the real sustainability contents. For more prestigious properties possessing this type of certification, increases in value are already applied to date.

According to IsIVI representative, the banking system can also play a decisive role in the real estate market to incentivise rewards for energy efficient buildings. Banks should offer subsidised/facilitated loans for the purchase of buildings that are more energetically and environmentally sustainable.

Finally, IsIVI representative highlights how the current "non-financial reporting" that real estate companies are applying to be "ESG compliant" as required by the EU, contributes to giving ever greater importance to the aspects of environmental sustainability and social responsibility and this will increasingly have an impact in the estimate of the value of the properties. The trend in the coming years will be to take into consideration more and more the needs of end users starting from the perceived "quality of life and well-being".

3.2.2 Austria

3.2.2.1 Real estate agent

The online survey for real estate agents was filled out by Anton Holzapfel, president of the Austrian Real Estate Association (Österreichischer Verband der Immobilienwirtschaft), lobbyist real estate industry and author of the book "Maklerrecht" (Agent law).

According to Mr. Holzapfel, energy efficiency is not considered enough and has only a minor effect on the value of a property. He points out that the clients are the key for appreciating the energy efficiency of buildings, and not the EPCs.

3.2.2.2 Real estate valuer

In the online survey, the Austrian real estate valuers were represented by Heimo Kranewitter, generally sworn and judicially certified expert for real estate valuations, editor of the Journal of Real Estate Valuation (Zeitschrift für Liegenschaftsbewertung) and author of the book "Liegenschaftsbewertung" (Real Estate Valuation), a standard work for real estate valuation in Austria.

According to Kranewitter, energy efficiency has an influence on the value of a building, even though it is not adequately recognised. While aspects such as the age and condition of the heating system and the source of energy and the energy consumption of property play important roles in the valuation, EPCs are of little importance. All in all, energy efficiency and sustainability aspects are considered in the valuation of a building, but those are only two out of many parameters.

Kranewitter points out that the EPC does not need amendments itself, however, since he does not trust the results of EPCs, he wishes for guaranteed accuracy of the EPCs.

3.2.3 France

3.2.3.1 Notary

In France, an interview with Frédéric Violeau was conducted, a notary in charge of the national real estate surveys published by Notaires de France on May 18th, 2022.

The introduction of the new EPC July 2021 aimed at answering the critics attached to the former version which was unreliable. The main question is whether this new certificate will modify the cartography linking EPC with the prices of individual houses and apartments.

By introducing a new EPC, the goal of the government was twofold:

1/ To increase its reliability and the trust of real estate owners and buyers. Indeed, the new EPC is opposable while the former was informative. If one buyer realises that the energy performance of the house / apartment recently bought, is not appropriate, he/she can sue the professional having made the energy diagnosis.

2/ To downgrade about 800.000 houses and apartments heated with gas or fuel oil and upgrade about the same number of houses and apartment heated with electricity. Indeed, energy coming from nuclear power stations does not generate CO_2 emissions.

However, the changes might be stronger than expected and cause some problems. This was already the case with apartments and houses constructed before 1975. Thus, the new EPC was suspended in September and October 2021, for those buildings. Moreover, to avoid any complaint from the buyer and to limit the risk attached to an inappropriate assessment, the person in charge of the diagnosis may downgrade the classification of several houses/apartments when information will be lacking or when some uncertainties remain. In area with low density and no house scarcity, the value of the real estate might be affected.

The fee of the person conducting the diagnosis is frequently standardised while assessments vary and are sometimes complex (about 150 parameters concerning the house need to be filled in with the new EPC). This situation reinforces the risk of downgrading houses. Indeed, qualitative assessments require time and competences to be performed.

Before this change of approach and for the last two years, the influence of EPC on real estate prices has been confirmed. Climate change and national campaigns about energy saving progressively raise the awareness of the population about the impact of building quality on energy bills and thermal comfort. Thus, buyers consider EPC as one relatively important technical criterion in housing appraisal. However, in metropolitan areas such as Paris and Lyon, this impact vanishes. Location remains the main element. The brown discount is also higher in the North of France because heating necessity is stronger than in the South where outside temperatures are warmer.

The notary stressed the importance to consider energy efficiency when performing a building valuation.

The notary in France considers the following energy efficiency features very important: EPC rating, Insulation of building envelope, and Age, type, and condition of heating system.

2. Importance of EE features when performing a building appraisal	France
Of little importance	Age, type, and condition of cooling/ventilation system Building automation and control system (BACS) Ease of upgrade
Moderately important	Age, type, and condition of DHW system Sources of energy used for building Calculated&/or measured energy Risk of value decline based on energy assessments
Very important	**EPC rating** Insulation of building envelope Age, type, and condition of heating system

Question related to the level of trust in the accuracy of EPCs reveals the medium trust of the interviewed notary in France. He also confirmed that valuations/appraisals only partly recognise the importance of energy efficiency

The interviewed notary considers the following three sustainability features essential when performing a building valuation:

- Site - location,
- Infrastructure - transport - services proximity,
- Broadband communication network.

8. Importance of features concerning building sustainability	France
Not important	Devices to reduce water consumption Green building materials Accessibility for persons with disabilities Availability and rating of a sustainability assessment certificate
Of little importance	Renewable energy production Indoor air quality and ventilation Acoustics comfort
Moderately important	Building resiliency Thermal comfort Daylighting sufficiency and visual comfort Operating and maintenance cost - life-cycle cost
Very important	**Site – location** Infrastructure - transport - services proximity Broadband communication network

The interviewed notary ranked the first five key drivers based on his opinion as follows (1 representing the most impactful):

1. Location,
2. Infrastructure - transport,
3. Services proximity,
4. Communication network, and
5. Operating and maintenance cost - life-cycle cost

putting energy efficiency in sixth place.

He also defined the following elements to raise further the impact of the next-generation EPCs on the real estate market:

- Reliability,
- Efficiency,
- Link with public aid (to improve real estate performance),
- communication of the EPC with every advertisement concerning the real estate (sell, rent),

- clearness and communication about EPCs settings (you don't really know exactly with the energy efficiency is rather good / bad).

3.2.3.2 Real estate valuer

According to the two valuers who were interviewed (the second valuer is expert at UNIS and he is a permanent representative to TEGOVA), energy efficiency is not yet the main driver impacting building value.

Location remains the most important criteria. The services associated with the immediate surroundings of the buildings are systematically valued by buyers. Services such as schools, shops, and transport are sought by households. This situation explains why location is still the first criteria when performing building valuation.

Energy efficiency is not central (rank 6 among key drivers according to the interviewee). The relative low price of energy in France may influence this result. In the second half of 2021, electricity prices (including taxes) for household consumers were lower than in most west-European countries: 0,2022 € TTC/kWh versus 0.3448 € TTC/kWh in Denmark, 0.3234 € TTC/kWh in Germany, 0.2816 € TTC/kWh in Spain and 0.2474 € TTC/kWh in the Euro area (Eurostat, 2022)[2]. However, its impact is growing, and it is integrated in building valuation. The price premium is difficult to appreciate since comparisons between buildings are frequently not feasible. Indeed, the database developed by French notaries is frequently uncompleted. Data concerning EPC may be registered but some details participating to building valuation are frequently missing (number of rooms, size of rooms, floor, positioning…). Despite this situation, a brown discount is frequently applied to buildings with lower EPC scores while a premium for buildings rated B or better was estimated between 5 and 10 %.

Energy issues also appear more important than the reduction of water consumption and indoor air quality. Indoor air quality appears strongly linked to the furniture and to users' behaviour (education and awareness on the role of windows openings).

Sustainability assessment certificates are also integrated when performing a building valuation. It plays a lower role for residential buildings than for commercial ones, but it is considered. For the head of the Innovation and Sustainable Development Department of Allianz real Estate (owner of residential and commercial buildings) who was also interviewed, the European taxonomy and the CRREM (Carbon Risk Real Estate Monitor) pathways are key tools to appreciate the carbon performance and the risk in real estate portfolios (CRREM was chosen by Allianz but it is not the reference for all real estate companies). EPCs are important to comply with the European Taxonomy. The new EPC, which was implemented in July 2021, is even more accurate and reliable. It should also contribute in the future to increase the weight of energy efficiency in the building valuation process. Moreover, the change of regulation will reinforce its role. For example, in 2025, owners will not be allowed to rent housing rated G.

[2] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Electricity_price_statistics

The results of the interviews are probably biased. All interviewees work in metropolitan areas characterised by a high density and housing scarcity. As mentioned before, in these areas, the relationship between observed market prices and EPCs is not significant. Location remains and will remain the main driver impacting building value. Valuers working in places with lower density, would probably have expressed a different judgment.

3.2.4 Ireland

Several expert interviews were carried out with experienced real estate agents and valuers across the country. A significant majority of these participants (91,7%) responded that they did consider energy efficiency when performing a buildings appraisal, with many viewing the age, type, and condition of both the building's heating and domestic hot water systems as key factors to be considered. About 75 % of respondents stated that they considered EPCs to be moderately or very important in the building appraisal process, with the majority (58,3%) stating that they would place a medium level of trust in their accuracy. In general, however, only one quarter (25 %) of respondents believed that the importance of energy efficiency was adequately recognised by the building appraisal process.

When asked what changes could be made to the EPCs that would be helpful to the building appraisal process, a number of specific suggestions were made, such as including airtightness and air control measurements, an indication of the average annual cost of heating the property, as well as an estimated breakdown of the cost of making improvements. Comments were also made regarding the transparency of the EPC process.

A sizeable cohort (41,7 %) of respondents felt that the recommendation for improving the efficiency of EPCs would influence the market value of a real estate property, though many other respondents were unsure. While there was a 50/50 split in the number of respondents aware of the latest proposal for a directive on the energy performance of buildings (published December 2021), the majority of participants were informed about the possible introduction of minimum energy performance standards for existing buildings. Regarding the impact of the next generation of EPCs on the real estate market, respondents considered the process would potentially be influenced by construction methods and costs, the introduction of grants, as well as the cost of energy.

When performing a building appraisal, some aspects were considered more influential on the appraised value than others, notably the site/location, building resiliency in response to extreme weather events, access to transport infrastructure and services, daylight sufficiency and visual comfort, broadband communication network, and the availability and rating of a sustainability assessment and certificate. Location, as well as the condition and size of the building, were frequently amongst the top-ranking key drivers impacting the appraised value of a building. The BER rating was only considered a key driver by 25 % of respondents. The buyer/tenant was thought to place a greater emphasis on the cost of renting/buying a property when choosing to buy/rent real estate, though the other factors of location, size, condition, etc. also featured amongst the key drivers.

Half of respondents considered the price premium (in %) for energy efficient real estate to be in the region of 0-20 %, though many others felt that this was a difficult

aspect to quantify. The result was similar when asked to estimate the price premium (in %) for real estate with a sustainability label. The energy efficiency of a property was considered by 83 % of respondents to be of moderate-high importance when influencing the decision to rent or buy, and energy efficient buildings (B rated or higher) were considered to sell more quickly. Summer overheating and green roofs did not appear to be a factor influencing purchasing decisions.

3.2.5 Croatia

3.2.5.1 Real estate agent

All active real estate agents in Croatia are listed within the register of real estate agents in Croatia at the Croatian Chamber of economy – Real estate association (Hrvatska gospodarska komora – Udruženje poslovanja nekretninama) (https://www.hgk.hr/udruzenje-poslovanja-nekretninama). The register is a public document and available for all to view (https://digitalnakomora.hr/e-javne-ovlasti/registar-posrednika-u-prometu-nekretnina).

The form, content, and method of keeping the register are determined by the Regulation on the Register of Real Estate Agents (Official Gazette 56/08) (*Pravilnik o registru posrednika u prometu nekretnina* (NN 56/08)). The Register maintains data on all the real estate agents to whom the Ministry of Economy has issued the decision on the registration in the Register of Real Estate Agents.

The conditions for performing real estate property appraisals in Croatia are prescribed by the Real Estate Brokerage act (Official Gazette 107/07, 144/12, 14/14, 32/19) (Zakon o posredovanju u prometu nekretnina (107/07, 144/12, 14/14, 32/19)).

To obtain a real estate agency license in Croatia, at least secondary education and passed professional exam are required. Training program for real estate agents is prescribed by the Ordinance on the Training Programme for Real Estate Agents (Official Gazette 56/08, 99/13, 115/13) (Pravilnik o programu osposobljavanja za agenta posredovanja u prometu nekretnina (NN 56/08, 99/13, 115/13)).

There are two energy labels classes on the first page of EPC in Croatia. The first label class is based on the calculated annual energy need for heating per useful floor area for the reference climatic data $Q''_{H,nd}$ [kWh/(m²a)], and the second label class is based on the calculated annual primary energy per useful floor area for the reference climatic data E_{prim} [kWh/(m²a)].

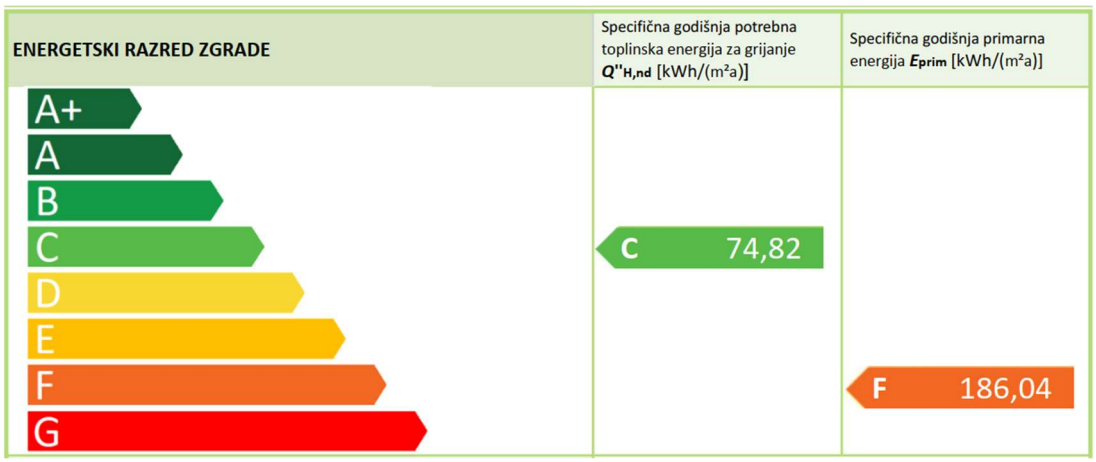

Figure 27: Two energy label classes on the first page of an EPC in Croatia

Based on the interview conducted with the real estate agent it is evident that even some real estate agents do not understand the difference between those two energy label classes at all.

EPCs of next generation in Croatia should be less technical, more user-friendly, easier to read and display more practical information for consumers.

Also, some consumers/buyers of real estate in Croatia are not aware of the new technology. Many of them still require an apartment with their own gas boiler. They are sceptic in the case of an apartment within a new residential building equipped with a heat pump and solar collectors for central space heating and domestic hot water preparation.

Real estate agents in Croatia are not qualified individuals. To become a real estate agent in Croatia, secondary education is required, and a professional exam needs to be passed. Real estate agents predict the market value of a building/apartment based on their experience, previous sales record, and knowledge of real estate trends in the local area.

The existing EPC is too technical and too complicated to be easily understood by non-experts and needs to be simplified.

One of the well-known requirements is that when a building or a building unit is offered for sale or for rent, the energy label class needs to be stated in the advertisement in commercial media. In Croatia, a private person can still publish an ad selling an apartment without an energy label class (https://www.njuskalo.hr/ the biggest advertising website for online advertising in Croatia).

The interviewed real estate agent highlighted the following issues in Croatia and gave suggestions.

Table 15: List of issues and suggestions from the side of the interviewed real estate agent in Croatia

Issue	Suggestion
The price of issuing some EPCs are too low – (the problem of trust in that EPCs exists)	The minimum prices for EPCs issuing should be defined
It is possible to advertise a building/building unit for selling/renting in some commercial media in Croatia without stated energy label class	Advertising a building/building unit for selling/renting in different types of commercial media should not be allowed without the energy label class
Many consumers don't understand EPC at all, they don't know the difference between those two stated energy label classes on the first page of Croatian EPC.	EPCs of next generation in Croatia should be less technical, more user-friendly, easier to read and display more practical information for consumers.
Some real estate agents do not understand EPCs in Croatia entirely (e.g., the difference between two energy label classes on the first page of EPC)	Additional education of real estate agents is required!
Some consumers do not understand new technology and its advantages and importance	Education for non-experts is required

3.2.5.2 Real estate valuer

Based on the opinion of a well-known and well-experienced court expert witness and real estate valuer and president of the Croatian association of court expert witnesses and valuers Melita Bestvina the following five key drivers should impact the building value in Croatia the most (1 representing the most impactful):

1. Location,
2. Building resiliency (extreme weather events, seismic and flood events),
3. Energy efficiency including healthy indoor conditions,
4. Functionality and property maintenance,
5. Sustainable building service life,

putting energy efficiency in third place.

Since the strongest earthquake in more than 140 years of magnitude 6,4 struck Croatia at midday on 29 December 2020 with its epicentre near Petrinja (60 km south of Zagreb), it is of utmost importance for all in Croatia when buying/renting real estate property the earthquake resilience of a building.

Energy efficiency should be an important feature nowadays when performing building valuations, but in most cases, it is not considered in Croatia due to the following two reasons:

- no EPC available at the point when building valuation is performed (it is not obligated to have an EPC at the point when building valuation is performed, and building owners are not interested in having EPCs),
- in the regulations related to real estate property valuation in Croatia (Real estate valuation act (Official Gazette 78/2015), Ordinance on real estate valuation methods (Official Gazette No 79/2014)) energy efficiency is not considered at all - the regulations in Croatia do not allow to consider energy efficiency when performing building valuation.

According to Mrs Bestvina in most cases of a building valuation·using market approach (or comparative method, market sales comparison approach) Croatian valuers have only an area of the property. The age of a building or the age of the last reconstruction is often not evaluated, as well as the technical building system.

It is already mentioned that there is the real estate information system called ‘eNekretnine’ (https://nekretnine.mgipu.hr/) in Croatia in place, which should ensure the transparency of the real estate market and contains data on the number of transactions for each area, on the types of real estate (apartment, single-family house, office premises, agricultural, construction, forest land), data on real estate that was the subject of the transaction and transaction prices achieved, etc. This database is based on the sales contracts, which are reported to the tax administration due to the settlement of the tax liability. According to Mrs Bestvina the issues related to the real estate information system called ‘eNekretnine’ are:

- no one controls the input of those data into the real estate information system called ‘eNekretnine’,
- the listed transaction prices are not equal to real achieved transaction prices, they are much lower in order to reduce the real estate transfer tax (tax rate in Croatia equals 3 % of the market value of the property at the moment of concluding the contract) when selling/buying property,

- database does not contain enough data on rental/lease agreements.

Court expert witnesses are not members of the tax commission in Croatia anymore.

According to Mrs Bestvina it is of utmost importance that court expert witnesses are the members of the tax commission to avoid unjustifiably reduced real estate values to reduce the real estate transfer tax. In Croatia now, the real estate transfer tax based on actual achieved transaction price is certainly not charged, because the listed transaction prices within the real estate information system ‘eNekretnine’ are lower than actual achieved transaction prices.

Reduced transaction prices are often reported to the tax commission in Croatia, partly due to real estate transfer tax.

It can be concluded that Croatia is probably among the rare EU member states, where energy efficiency is not considered when performing building valuations because Croatian regulations are still not harmonised with the European Valuations standards.

In the current praxis it means the following: if you have two buildings on the same location, a B-rated building and a G-rated building – there is no way to consider energy efficiency of those two buildings due to the lack of evaluation criteria in the existing regulations related to real estate property valuation and the specific valuation prices of those two buildings per m^2 are the same.

4 Identification of elements to further raise the impact of the next generation EPCs on real estate market

Based on:

- the analysed national regulations and standards in each project partner country,
- the overview of national property price registers across project partner countries,
- the overview of national leases registers across project partner countries,
- the conducted extensive literature review performed within chapter 2 about the impact of energy efficiency and sustainability features (e.g., EPC rating, sustainability ratings such as BREAM, LEED),
- the conducted expert interviews among real estate agents and valuers (chapter 3),

it was possible to identify elements to raise further the impact of the next generation EPCs on real estate.

The following table (Table 16) summarises the major findings obtained under task 1.4 and identified elements to raise further the impact of the next generation EPCs on real estate market. Please note that some key findings are country specific.

Table 16 provides the identified elements within the following main thematic areas:

1. EPCs – energy performance certificates,
2. SCs – sustainability certificates,
3. National regulations for property valuation,
4. Property price and leases registers,
5. Real estate agents,
6. Real estate valuers,
7. Building users – citizens,
8. DBLs – digital building logbooks.

Table 16: Summary of key findings - identified elements to raise further the impact of the next-generation EPCs on real estate market

Thematic area		Identified elements to raise further the impact of the next-generation EPCs on real estate market	Country specific	Reference
1. EPCs	1	**Making EPCs more understandable and user friendly to grasp for non-experts** EPCs should be less technical, easier to read and display more practical information for consumers; CLEAR DESIGN using drawings	All	Chapter 3.1.1
	2	**Indicating additional data on EPCs**		
		- annual energy savings	All	
		- financial (annual cost savings), environmental (reduction of the carbon footprint), social benefits and health benefits using appropriate KPIs,	All	
		- financial indicators to better highlight financial benefits of energy, health, and comfort upgrades in terms of asset value and risk protection	All	
		- building renovation (investment) costs	All	
		- airtightness and air control measurements, an indication of the average annual cost of heating the property, as well as an estimated breakdown of the cost of making improvements	Ireland	Chapter 3.2.4
	3	**Increasing level of trust in the accuracy of EPCs**	All	Chapter 3.1
	4	**Increasing the rate of quality control of EPCs and improving the quality control of EPCs (assurance of the quality control)** Problem of low prices for issuing EPCs in Austria and Croatia	Austria, Croatia	Chapters 3.1.2, 3.2.5.1
	5	**Prescribing minimum prices for EPCs issuing** Based on the type of a building and useful floor area	Austria, Croatia	Chapters 3.1.2, 3.2.5.1
	6	**Further developing BER certification covering also residential properties**	Ireland	
	7	**Indicating only one EPC label on the first page of an EPC based on the calculated annual primary energy**	Croatia	Chapter 3.2.5.2
2. SCs	8	**Raising awareness of building sustainability aspects among experts, non-experts and building users - citizens**	All	
3. National regulations for property valuation	9	**Introducing the obligation to have in place a unified property price register at national level** (ImmoWertV 2021 in Germany, Liegenschaftsbewertungsgesetz in Austria)	Germany, Austria	Chapter 1.4
	10	**Introducing the obligation to have in place a unified leases register at national level** It could be the part of existing property price register like in Italy and Ireland	Germany, Austria, Croatia	Chapter 1.4
	11	**Considering energy efficiency and sustainability within the existing regulations** Real estate valuation act (Official Gazette 78/2015) Ordinance on real estate valuation methods (Official Gazette No 79/2014)	Croatia	Chapter 3.2.5.1
	12	**Introducing the obligation to have an EPC when performing building valuation** It is not obligated to have an EPC at the point when building valuation is performed	Croatia	Chapter 3.2.5.2

Thematic area		Identified elements to raise further the impact of the next-generation EPCs on real estate market	Country specific	Reference
	13	**Introducing the obligation to control the input of data into the real estate information system**	Croatia	Chapter 3.2.5.2
4. Property price and leases registers	14	**Integrating a national database of EPCs with a property price register** Alongside the achieved property prices, a property price register should include an EPC labels and other data related to building energy efficiency	All	Chapter 1.4
	15	**Integrating a national database of EPCs with a leases register** Alongside the rental prices, a leases register should include an EPC labels and other data related to building energy efficiency	All	Chapter 1.4
5. Real estate agents	16	**Providing additional education for real estate agents in the field of energy performance certifications, energy efficiency and renewable-based technologies**	Italy, Croatia	Chapters 3.2.1.1, 3.2.5.1
6. Real estate valuers	17	**Providing additional education for real estate valuers in the field of energy performance certifications, energy efficiency and renewable-based technologies** – if necessary	All	
7. Building users - citizens	18	**Providing basic education for building users in the field of energy performance certifications, energy efficiency and renewable-based technologies** **Promoting widespread communication campaigns among citizenship**	All	
8. DBLs	19	**Introducing digital building logbook (DBL)** as a common repository of all relevant building data within the entire building life cycle, providing building related data to different stakeholders	All	

4.1 EPCs – energy performance certificates

EPCs should directly impact the value of the properties driving the investor in the energy renovation process. EPCs have already raised awareness but could be more effective, and therefore upgrading existing EPCs is necessary.

First, it is necessary to make EPCs more user friendly and understandable to end-users to overcome obstacles facing a wider use of EPCs across Europe because many end-users consider an EPC just as another piece of paper. Also, many real estate agents, on average, do not have the technical skills necessary to properly use the information provided by the EPC (e.g., Italy, Croatia). Some real estate agents in Croatia do not distinguish between annual energy need for heating and primary energy. The existing EPCs are too technical and too complicated to be easily understood by non-experts and needs to be simplified.

Second, ECPs should contain additional data such as:

- annual energy savings,
- financial (annual cost savings), environmental (reduction of the carbon footprint), social benefits and health benefits using appropriate KPIs,
- financial indicators to better highlight financial benefits of energy, health, and comfort upgrades in terms of asset value and risk protection
- building renovation (investment) costs,
- airtightness and air control measurements.

The two conducted questionnaires revealed a medium trust or even distrust of real estate agents/valuers in EPCs. Hence, it is crucial to increase the level of trust in the accuracy of EPCs by improving the quality control of EPCs (assurance of the quality control), prescribing minimum prices for EPCs issuing (e.g., Austria, Croatia) and further developing BER certification covering also residential properties (Ireland).

4.2 SCs – sustainability certificates

Raising awareness of building sustainability aspects among experts, non-experts and building users - citizens through education is advisable.

4.3 National regulations for property valuation

In countries with neither a property price register nor a lease register at the national level, national regulations should prescribe a mandatory existence of a unified property price register (containing transaction values of sold properties) and leases register (containing rents) at the national level.

Also, in all national regulations related to real estate valuation sustainability and energy efficiency must be considered when performing building valuations.

An EPC must be available at the point when building valuation is performed.

National regulations for property valuation need to prescribe the obligation to control the data input into the real estate information system. An example from Croatia shows that in some cases, the listed transaction prices within the Croatian real estate information system called ‘eNekretnine’ are much lower than the achieved transaction prices in order to reduce the real estate transfer tax (tax rate

in Croatia equals 3 % of the market value of the property at the moment of concluding the contract) when selling/buying property.

4.4 Property price and leases registers

In many European projects and studies, it is stressed out that the main challenge is the lack of access to sufficient data. It is impossible to evaluate the link between EPCs and property prices, since the existing official EPC databases do not contain sales or rental transactions, and existing property price and leases registers do not contain EPC labels or data related to building energy efficiency.

There are two possible solutions:

- Cross-referencing those databases (EPC database and property price/leases register must be cross-referenced with each other),
- Introducing Digital building logbook (see chapter 4.8).

4.5 Real estate agents

Based on the experience in Italy and Croatia, real estate agents do not have, on average, the required technical skills (one of the requirements to become a real estate agent is secondary education) to cover the field of energy performance certifications, energy efficiency and renewable-based technologies.

Data provided by the EPC are difficult to be understood by the real estate agents and normally they are not used to require the support of third-party external experts to analyse technical data in EPC.

It is advisable to introduce additional education for real estate agents covering the field of energy performance certifications, energy efficiency, and renewable-based technologies.

4.6 Real estate valuers

The last edition of RICS Valuation - Global Standards (Red Book), published by the Royal Institution of Chartered Surveyors (RICS), effective from January 2022, states that "*valuers may not have the specialist knowledge and experience required, and that in appropriate cases, valuers may recommend making further enquiries and/or obtaining further specialist or expert advice in respect of sustainability and ESG matters*". If necessary, introducing additional education for real estate valuers covering the field of energy performance certifications, energy efficiency, and renewable-based technologies could be partly a solution.

4.7 Building users – citizens

The existing EPC is too technical and too complicated to be easily understood by non-experts and needs to be simplified.

Also, some consumers/buyers of real estate are not aware of the new renewable-based technology (e.g., in Croatia). They are not familiar with EPCs, and the requirements of the EPBD directive.

It is advisable to promote widespread communication campaigns among citizens and provide basic education in energy performance certifications, energy efficiency and renewable-based technologies.

4.8 DBLs – Digital Building Logbooks

One of many obstacles in considering energy efficiency and sustainability when performing real estate valuation is the lack of access to sufficient building related data (limited data availability). A digital building logbook could be a solution to overcome the outlined obstacle.

The concept of a Digital Building Logbook (DBL) was first introduced with the European Strategy 'Renovation Wave'. The renovation wave strategy published by the European Commission in October 2020 states that the Commission will introduce Digital building logbooks that will integrate all building related data to ensure compatibility and integration of data throughout the entire building life cycle. It also states that "*Digital building Logbooks will serve as repositories for data on individual buildings and facilitate information sharing within the construction sector, and between building owners and tenants, financial institutions and public authorities*".

The Digital Building Logbook could aggregate all relevant building data and documents, ensuring access to sufficient information. It is expected that this scheme, through increased data transparency and availability to a broad range of market players could overcome the current lack of a common repository for building data that could spur innovation, reduce additional costs and inefficiencies, and increase investors' confidence.

Imagine a database where you could find all building related data and documentation in digital form within the entire building life cycle from design&planning to building demolition.

In the year 2020 the European Commission published the following three reports with the main aim to support the widespread use of digital building logbooks across Europe and to encourage data transparency and increased data availability to a broad range of market players, including property owners, tenants, investors, financial institutions, and public administrations:

- DEFINITION OF THE DIGITAL BUILDING LOGBOOK - Report 1 of the Study on the development of a European Union Framework for Buildings' Digital Logbook, July 2020,
- BUILDING LOGBOOK STATE OF PLAY - Report 2 of the Study on the development of a European Union Framework for Buildings' Digital Logbook, July 2020,
- Study on the Development of a European Union Framework for Digital Building Logbooks FINAL REPORT, December 2020.

Report 1 of the Study on the development of a European Union Framework for Buildings' Digital Logbook indicated the following possible digital logbook data structure:

A. Administrative information
B. General information

C. Building descriptions and characteristics
D. Building operation and use
E. Building performance
F. Building material inventory
G. Smart readiness
H. Finance

The last module, named *H. Finance*, could contain the transaction values of sold properties and rents alongside all other data. Module *E. Building performance* contains EPC labels of buildings being sold or rented or other data related to building energy efficiency. Module *C. Building descriptions and characteristics* contains all data related to building envelope and existing technical building system.

Digital Building Logbooks could become a great tool also for real estate agents/valuers when performing building valuations. All building-related data required for a proper building valuation would be in one place.

Having digital building logbooks in place would make it possible to evaluate the correlation between EPCs and property prices.

5 Final remarks

Based on the conducted interviews with real estate agents and valuers across the EUB SuperHub project partner countries in 2022, it is evident that the introduction of EPC had made a marginal contribution to the existing practice of building valuation in the examined countries. Energy efficiency has a rather negligible impact on building value compared with traditional value drivers such as location and accessibility. When buying/renting real estate, the main drivers are still location, transport - infrastructure, services availability, and building age. It is noteworthy that information communication technologies (ICT), particularly broadband has made an appearance within the first five drivers. Location was also the main driver considered within a survey conducted among real estate agents in 2016 within the ZEBRA2020 project, followed by the price of real estate and the size of real estate.

In the context of the current energy crisis and the EU's climate goals, it is more than ever of utmost importance to reduce EU dependence on fossil fuels in the existing building stock. The need for energy efficiency and the large-scale deployment of renewable-based technologies has never been greater. Energy efficiency and smart building technologies will become more important with higher energy prices. These elements will eventually have a greater impact on the building value.

This report aimed to understand the importance of energy efficiency and sustainability aspects when performing building valuations. This question was answered based on:

- the analysed national regulations and standards in each project partner country,
- the overview of national property price registers across project partner countries,
- the overview of national leases registers across project partner countries,
- the conducted extensive literature review performed about the impact of energy efficiency and sustainability features,
- the conducted expert interviews among real estate agents and valuers.

Based on that, it was possible to identify 19 elements that can contribute to raising the impact of the next generation EPCs on real estate value. These elements cover the following main thematic areas (see Table 16):

1. EPCs – energy performance certificates,
2. SCs – sustainability certificates,
3. National regulations for property valuation,
4. Property price and leases registers,
5. Real estate agents,
6. Real estate valuers,
7. Building users – citizens,
8. DBLs – digital building logbooks.

When performing building valuation, the green and/or health-related features of the building such as energy efficiency or indoor air quality also need to be considered. It is essential to be able to distinguish between efficient and inefficient

buildings. The goal is not to increase the price of already too expensive energy-efficient buildings. The goal is to decrease the value of inefficient buildings consuming too much energy and not providing high-level health and well-being conditions for occupants.

If a building is inefficient, consuming too much energy and falling below standards, it should become less attractive and obsolete, and consequently experience the so-called “brown discount”. On the other hand, a building that achieves sustainability requirements and other green features (such as solar panels, PVs, heat pumps, energy-efficient lighting, and automation) should experience a “green premium”.

It is advisable to introduce the concept of digital building logbooks to overcome the main challenge of a lack of access to sufficient building-related data when performing building valuations.

The EUB SuperHub deliverable named *D2.4 The digital logbook, the definition of data requirements, sources and collection process* will discuss digital building logbooks and propose the digital building logbook structure covering building valuation alongside all other building-related data.

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