WORK PACKAGE 2

REPORT D2

International, European and national valuation practices and connecting points to energy performance certificates and LCC assessment

Authors:	Bienert, Sven	KPMG Austria
	Bobsin, Kerstin	Dr. Leopoldsberger + Partner
	Leopoldsberger, Gerrit	Dr. Leopoldsberger + Partner
	Popescu, Daniela	TU Iasi
	Schützenhofer, Christian	KPMG Austria
	Steixner, David	FH Kufstein

Work Package 2: Assessment of property valuation approaches

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Co-ordinator: KPMG Financial Advisory Services GmbH
Dr. Sven Bienert
sbienert@kpmg.at

Project website: www.immovalue.org

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II. Glossary

ABGR..... Australian Building Greenhouse Rating

AI..... Appraisal Institute

API ..... Australian Property Institute

ASB ..... Appraisal Standards Board

BREEAM ..... Building Research Establishment Environmental Assessment Method

CASBEE..... Comprehensive Assessment System of Building Environmental Efficiency

CPD ..... Continued Professional Development

CSR ..... Corporate Social Responsibility

DCF ..... Discounted Cash Flow

EEA ..... European Environment Agency

EPBC..... European Energy Performance Building Directive

EPC..... Energy Performance Certificates

ESD ..... Environmental Sustainable Design

EVS ..... European Valuation Standards

FCA ..... Full-Cost Accounting

GBCA..... Green Building Council of Australia

IMT..... Institute for Market Transformation

ImmoWertV ..... “Immobilienwertermittlungsverordnung”

IRR ..... Internal Rate of Return

IVS ..... International Valuation Standards

IVSC..... International Valuation Standards Committee

LBG..... “Liegenschaftsbewertungsgesetz”

LCC ..... Life-Cycle Costing

LCCA ..... Life-Cycle Costing Analyses

LEED..... Leadership in Energy and Environmental Design

NABERS ..... National Australian Built Environment Rating System

NIY ..... Net Initial Yield

NOI..... Net Operating Income

NYSERDA ..... New York State Energy Research and Development Authority

PINZ ..... Property Insitute of New Zealand

NOI..... Net Operating Income

NIY ..... Net Initial Yield

RICS ..... Royal Institution of Chartered Surveyors

TBL ..... Triple Bottom Line

TEGoVA ..... The European Group of Valuers' Associations

TIAVSC ..... The International Assets Valuation Standards Committee

UK ..... United Kingdom

US/USA..... United States of Amerika

USPAP ..... Uniform Standard of Professional Appraisal Practice

V ..... "Vervielfältiger"

WBCSD..... World Business Council on Sustainability Development

WertR ..... "Wertermittlungsrichtlinie"

WertV ..... "Wertermittlungsverordnung"

WP..... work package (internal IMMOVALUE expression)

V ..... Vervielfältiger

Y ..... Yield

YP..... Year's Purchase

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1 Introduction

In 2002 every member state of the European Union was starting to integrate the requested issue of the European Energy Performance of Buildings Directive, EPBD, into national law. The outcome of the directive is that all over Europe energy performance certificates (EPC) have to be available for new and already existing buildings. This arises opportunities for investors, landlords and as well tenants to assess the energy efficiency of a building and hence the related energy costs. Furthermore property investors and decision makers as well as property owners and tenants are starting to pay attention to issues like corporate social responsibility (CSR), and responsible property investment (RPI), i.e. are taking sustainability and energetic building performance into account as a factor in today's investment decision process. Therefore the awareness and understanding to which extend these issues affect property worth and value has become increasingly important.

As a consequence real estate experts nowadays already were discussing, agreed and are persuaded that these movements and changes will have an impact on the real estate market and characteristics as well as the investors and owners market behaviour and willingness to pay in the mid and long run. This will and have to result in higher awareness of property appraisers to such aspects and also will impact property valuation practice in the future. An answer in which extend and in which way developments such as EPC will influence today's real estate market respectively property sales and rents cannot be given at the moment due to the lack of market evidence and rare data. However, to be able to show these affects on property worth and value it is necessary to establish adequate mechanisms which are able to illustrate these aspects within the property appraisal process.

Even though real estate professionals are aware of the future relevance of sustainable issues in real estate business. Recently there are just limited discussions and examinations available which try to identify, quantify and measure the market impact of sustainable and green building features.

Therefore the project IMMOVALUE aims to determine and define a common approach/methodology how new restrictions regarding sustainability and green building features such as EPC as well as life-cycle costing (LCC) and analysis - which recently become more important than ever before - could be integrated in today's property valuation practice.

To assure this overall aim and objective of IMMOVALUE the project was divided into several work packages. In a first step the project team investigate and describe current practice in property valuation (work package 2), generating EPC (work package 3) and LCC (work package 4) and explores possibilities for linking these aspects together. In a second step a solid methodology will be developed (work package 5) and tested in practice via pilot projects (work package 6). In the third and last step the newly developed and tested property valuation approach will be reviewed by experts (work package 7) and disseminated to the market (work package 8) to ensure a broad acceptance and perpetuity for the importance of sustainability and green building features considerations within the property valuation practice.

2 Objectives of WP 2

To express the goal and objectives of work package 2, first we have to remind the overall aim of the IMMOVALUE project as well. The project will find implicitly linkages between the upcoming aspect of energy efficiency of buildings, their direct rather indirect impacts and differences within the life cycle costs of a building and property valuation.

Therefore work package 2 is dealing with the collection and assessment of property valuation approaches with a focus on identifying possible linkages for integration of energy efficiency and life cycle costing related indicators. The increasing number of articles, publications and naturally discussions all over the world demonstrate the importance of the topic and their internationality at all. Therefore a categorisation of international and national valuation methodologies will be mentioned and explained as well (see Chapter 3).

The aim of work package 2 is to give an overview about already existing ideas and approaches for an integration of building performance assessment (see Chapter 4) respectively energy performance certificates and Life-Cycle Costing Analyses (LCCA), which should create the basis for establishing an adequate and suitable property valuation methodology (respectively adjustment methodology) for an integration of energy performance and Life-Cycle Costing (LCC) aspects. Furthermore a description of possible property valuation indicators and investigation of potential adjusted valuation methodologies, which might be adequate for linkages to energy performance certificate and LCC, will be under examination (see Chapter 5).

3 Compact Overview of Valuation Methods

In the following chapters a short overview of the relevant methodologies for the valuation of property and buildings is given. The focus of the analysis is based on the project participating countries though Austria, Germany, Norway and Rumania as well as general approaches concerning valuation. In addition to the importance of its market the United Kingdom is added to the analysis. To show the differences and similarities an overview of the general concepts is given first.

3.1 Concept of Value

Value is a concept that has to be distinguished from the related terms price, worth and costs.

- Value
  is an estimate of the price that would be achieved if the property were to be sold in the market.[1]
- Price
  is the actual observable exchange price in the open market, only influenced by one buyer and one seller.[2]
- Worth[3]
  is a specific investor's perception of the capital sum, which he would be prepared to pay for the stream of benefits, which he expects to be produced by the investment. Some investors may have different perceptions of the investment; they might have different tax rates from their competitors or different abilities to raise finance.[4]
- Costs
  The value of a property is not necessarily closely related to it's construction costs. In many cases the costs were totally ignored by market participants, because costs are

[1] Cf. IVSC (2007), p. 26, 421, TEGoVA (2008), p. 7.
[2] Cf. IVSC (2007), p. 25, 396.
[3] Also known as investment value.
[4] Cf. IVSC (2007), p. 33, RICS (2007), p. 47, TEGoVA (2008), p. 20.

considered to be “historic” information where value, price and worth are based on future benefits.[5]

3.2 General Valuation Approaches

Basically property valuation all over the world follows the same methods. In some jurisdiction those rules are written in formal law and codes in other professional organisation were organizing the formal patterns of valuation like the Royal Institution of Chartered Surveyors (RICS), London, the Appraisal Institute (AI), Chicago or the International Valuation Standards Committee (IVSC), London, or the European Group of Valuers' Association (TEGoVA), Brussels.

But in general the essence of valuation is the same: It should be "[...] an estimation of the most likely selling price on the open market […]."[6]

The target for the valuation professionals is in most circumstances the “Market Value”. RICS; IVC and TEGoVA are using the same definition of "Market Value", which is:

> *"The estimated amount for which the property should exchange on the date of valuation between a willing buyer and a willing seller in an arm’s length transaction after proper marketing wherein the parties had each acted knowledgeably, prudently and without compulsion. The market value shall be documented in a transparent and clear manner."*[7]

The definition of “Market Value” used by the Appraisal Institute is much longer but will guide appraisers to the same result like the definition given above.[8]

General international practice of property valuation deals with three approaches to achieve the market value of a property:

- The Comparison Approach,
- The Cost Approach and
- The Income Approach. [9].

The following chapters explain these three main valuation approaches.

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[5] Cf. IVSC (2007), p. 25, 345, RICS (2007), p. 42, 48.
[6] Sayce et al. (2006), p. 11.
[7] cf. IVSC (2007), p. 27, TEGoVA 2009, p. 8, RICS (2007), p. 42.
[8] Cf. Appraisal Institute (2008), p. 22 et seqq., USPAP (2008/2009), p U-3.
[9] Gelbtuch (1997): p. ix.

In addition to the aim of the EU project IMMOVALUE, to evaluate a cross-border valuation methodology to reflect the aspects of sustainability respectively the energy efficiency of buildings the principles of the International Standards Committee (IVSC) and the European Standards Committee, the TEGoVA will be figured out. Afterwards the valuation methodologies of the project member countries, Austria, Germany, Norway and Romania will be explained.

Concluding due to the exceptional position of the RICS within the valuation of properties all over the world the RICS valuation standards have to be mentioned as well.

The American appraisal habits differ to some extent from the approaches described in this chapter. Those specific circumstances will be taken into consideration, when the American experience with the energy performances will described in Chapter 4.1.2.1.

3.2.1 Sales Comparison Approaches

The following flow chart demonstrates the global principle for the sales comparison approach respectively called comparative approach.

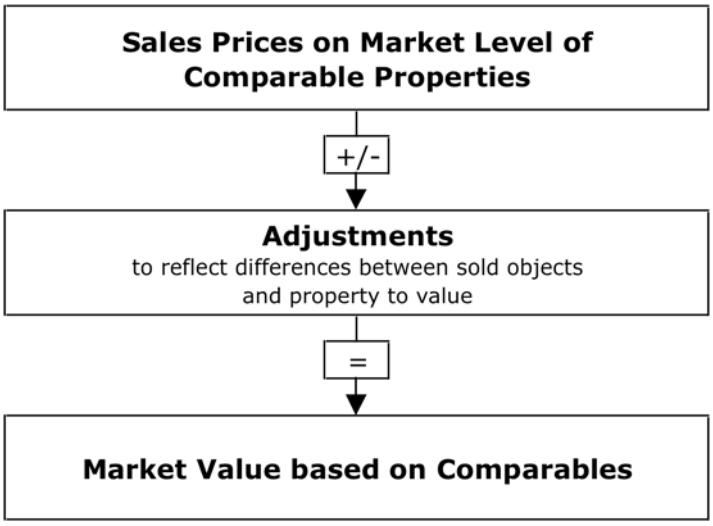

Figure 1: General Sales Comparison Approach or Comparative Approach

The comparison approach should be the privileged one for establishing the market value of a vacant or improved property. Basically the valuer is looking for a representative amount of comparable sales figures. The valuer is analyzing closed sales, listings, pending sales of similar properties. By using the comparison approach the valuer have to check the main

characteristics (size, type of using, location, etc.) of the compared properties. Afterwards the decision for using the existing comparables and deriving the value with the aid of the comparison approach has to be done. [10]

The sales prices can be published for the whole property or simply for the building and its associated facilities.[11]

In the case of published sales prices for the building the appraiser have to estimate separately the value of the land. This should be done with the aid of comparables for sales prices for similar located and used land. At the end the value will be evaluated by the sum of the sales price for the building facilities and the value of the land.[12]

By identifying similarities and differences the valuer have to analyze and respectively to make a decision if sales prices are representative and useable for the property being valued. Adjustments like depreciation for neglected maintenance derived from market evidence have to be made.[13]

3.2.2 Cost Related Approaches

The second approach used to determine the market value is the cost approach. It can either be based on the reproduction costs or on the replacement costs.

The general concept of the cost approach is shown in Figure 2.

[10] cf. Appraisal Institute (2008b), p. 297.
[11] Ibid.
[12] ibid. p. 315.
[13] Ibid. p. 315 et seqq.

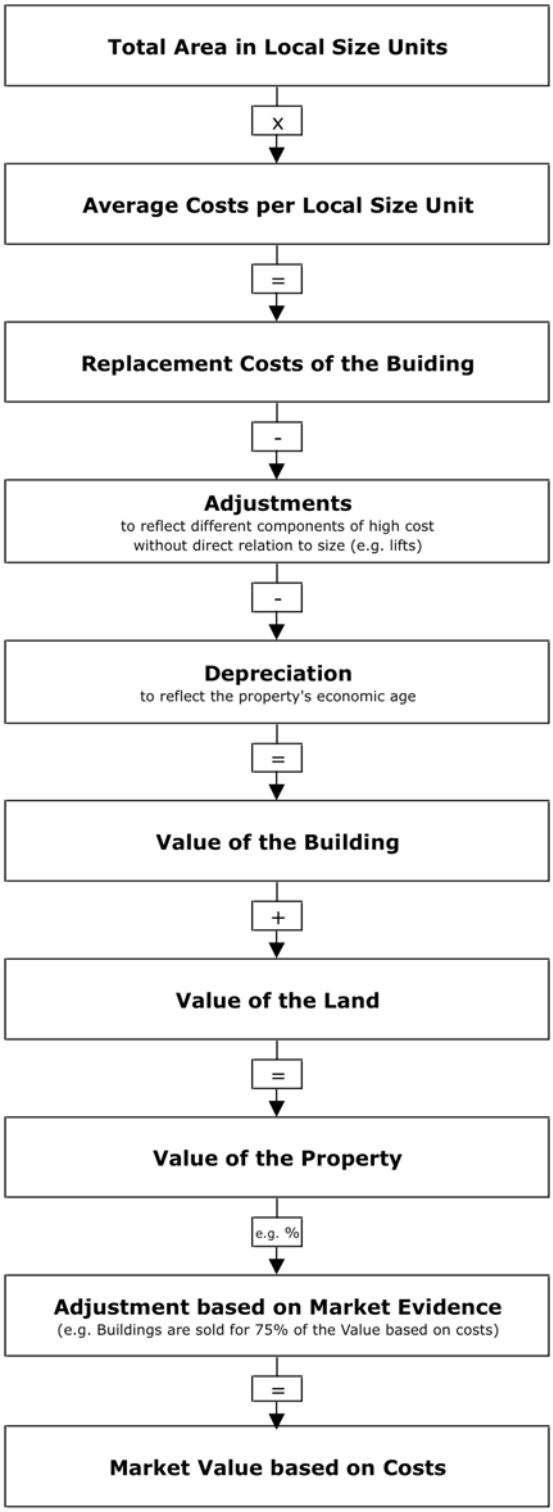

Figure 2: General Cost Approach

The first step is to measure the size of the property. According to local market habits this might be either the net or the gross leaseable area.

In the second step the size is multiplied by the average costs per unit. Again these costs per unit can either be replacement or reproduction costs.

Thirdly adjustments have to be made to reflect the property's differences compared to the properties the costs were derived from.

The age of a building should be considered by using a depreciation method. This can be done by different approaches e.g. linear (mathematical based) or non-linear (market based). [14] In some jurisdictions the depreciation also covers the general market assumption for these older buildings in other there is an addition adjustments to derive a market value from the cost approach. Because of the problems connected to these adjustments the cost approach is often not considered to be an approach that lead to market value.[15]

3.2.3 Income related approaches

The income related approaches are divided into two chapters. Firstly the traditional direct capitalization approach and secondly the discounted cash flow approach. Both approaches will give the same results if properly handled.

3.2.3.1 Direct capitalization approach

The direct capitalization approach reflects the future annual earning power of properties. The appraiser estimates the properties capacity to generate benefits and capitalises them into an indication of present value respectively market value.[16]

International valuers using two different ways of calculating the market value based on the annual rental income. On the one hand appraisers are dividing the annual rent by market given yield respectively capitalisation rate (see left flow-chart of Figure 3) and on the other hand they derive the market value by deriving a multiplier out of those yields respectively capitalisation rates (see right flow-chart of Figure 3).

It is only a different method of illustration. Mathematically it is completely the same.

[14] Cf. Appraisal Institute (2008b), p. 377 seqq.
[15] Cf. Ibid.
[16] Ibid. p. 445.

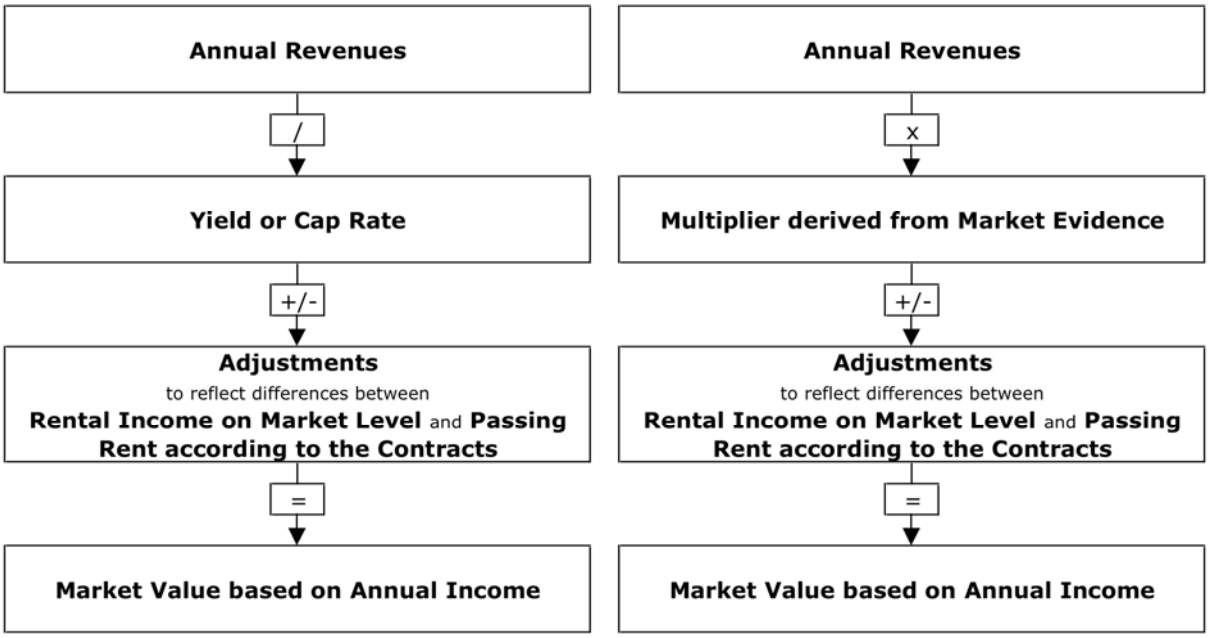

Figure 3: General Income Approach

3.2.3.2 Discounted Cash Flow (DCF)

In addition to the direct capitalisation in Chapter 3.2.3.1, especially shown in Figure 3 there is a second kind of income approach called Discounted Cash Flow or DCF. The main differences are that the income and costs remain at the same level for perpetuity, where as in the DCF approach revenues and costs might be different from year to year.

In order not to calculate revenues and outgoings on a yearly based for all the remaining years of a property the DCF calculate the first ten years in detail and assumes that the property is sold thereafter.

In Figure 4 is shown, that the first step of using the DCF approach is to calculate the revenues and outgoings for the first period, most often 10 years, and the year immediately following, i.e. year 11. Step II in Figure 4 is to strike the balance and to generate the annual cash flows for year 1 to 10. Because of the assumption, that the property will be sold at the beginning of year 11 based on this year‘s cash flow the sale has to be calculated as well. Dividing the cash flow of year 11 by a yield rate that reflects that the property is 10 years older than in year 1 does this. This yield is called exit yield or terminal capitalization rate.

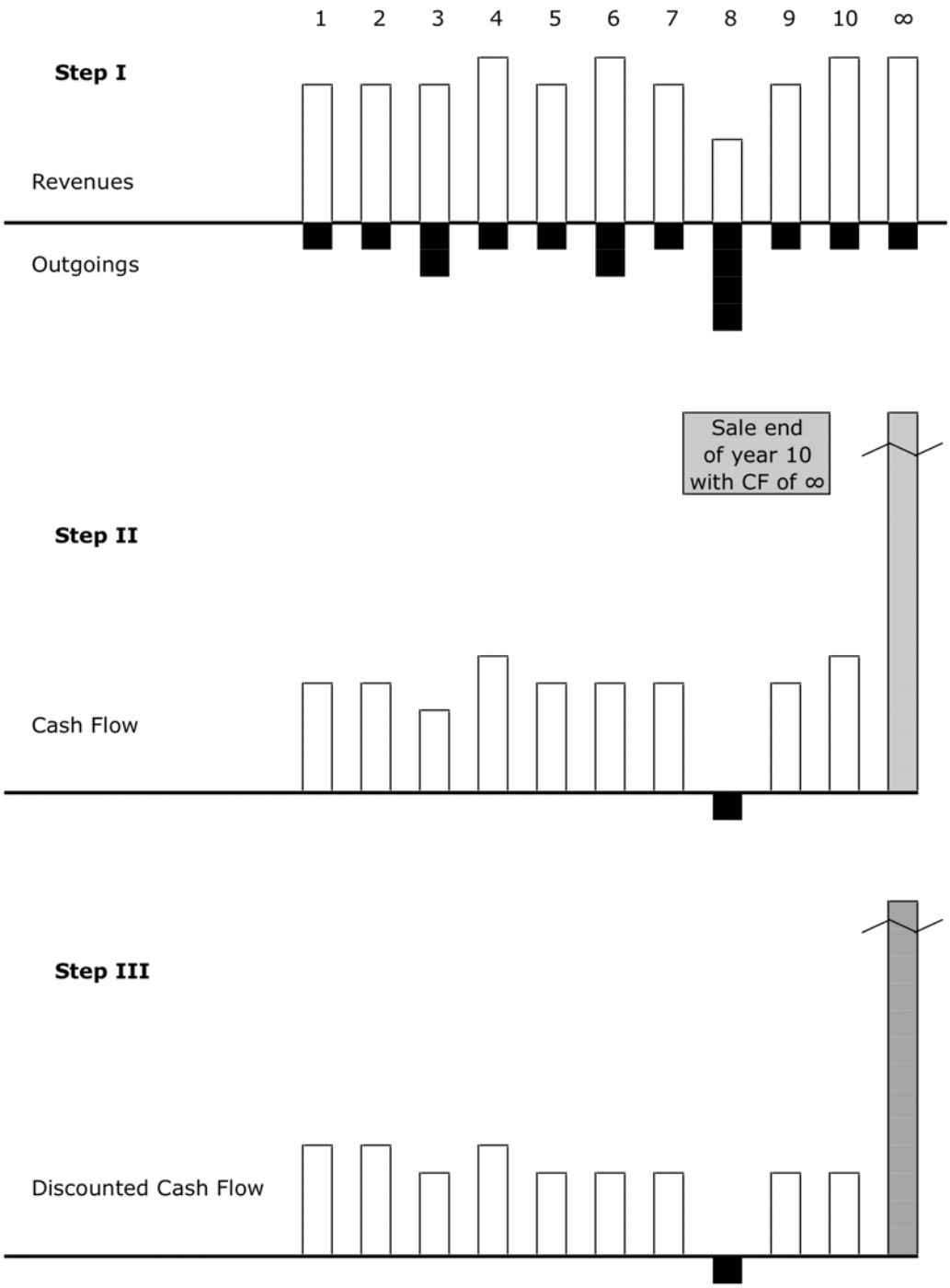

Figure 4: General DCF approach

The final step is to discount the cash flows using a discount rate, the reflects that the inflation is covered in the yearly amounts of revenues and costs and therefore will be lower then the exit yield.

The market value is therefore the present value of all the discounted cash flows including the discounted amount for the sale at the beginning of year 11.

Especially when revenues and costs will highly differ from year to year the DCF approach might be more appropriate than the traditional direct capitalisation.

But because the discount rate and the terminal rate differ from the overall cap rate respectively the net initial yield used in the income approach the results of the DCF and the traditional direct capitalisation are the same due to the fact that there is just one market value for one property regardless, which valuation method is used.

3.3 Multinational Standards

There are valuation standards that are in use in an international context. First the "International Valuation Standards" known as the “The White Book” published by the in London based International Valuation Standards Committee (IVSC), secondly the "Valuation Standards" of the Royal Institution of Chartered Surveyors (RICS), commonly known as "The Red Book" and thirdly the "European Valuation Standards" published by The European Group of Valuers' Associations (TEGoVA), commonly known as "The Blue Book".

All the multinational standards do not deal with approaches in depth. For example: in the International Valuation Standard the three approaches already mentioned in Chapter 3.1 as described altogether in less than one page.[17]

3.3.1 International Valuation Standards

3.3.1.1 Introduction

The International Assets Valuation Standards Committee (TIAVSC) was found due to discussions between British and American appraisers in the late 70's in 1981. In 1994 the Committee was renamed into International Valuation Standards Committee (IVSC). Meanwhile the Committee is represented in 52 countries. The first edition of IVS was published in 1985. The current version, the eighth edition of the International Valuation Standards was released in 2007.[18]

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[17] IVSC (2007), p. 32.
[18] Cf. www.ivsc.org/about/index.html.

The principal objective of the International Valuation Standards was to formulate in the public interest, valuation standards and procedural guidance for the valuation of assets for use in financial statements, and to promote their worldwide acceptance and observance.

The second objective was to harmonize these standards among the world's states, and to make disclosures of differences in standards statements and/or applications of standards as they occur. It was a particular goal that international valuation standards be recognized in statements of international accounting and other reporting standards, and that valuers recognize what is needed from them under the standards of other professional disciplines.[19]

Because of the main objectives the description of methods was not of particular interest. Therefore only on one page the three valuation approaches were described. These descriptions of the approaches are in line with the ones in Chapters in 3.2.1 to 3.2.2.

3.3.1.2 Methodologies

3.3.1.2.1 Sales Comparison Approach

"This comparative approach considers the sales of similar or substitute properties and related market data, and establishes a value estimate by processes involving comparison. In general, a property being valued (a subject property) is compared with sales of similar properties that have been transacted in the market. Listings and offerings may also be considered."[20]

3.3.1.2.2 Cost Approach

"This comparative approach considers the possibility that, as an alternative to the purchase of a given property, one could acquire a modern equivalent asset that would provide equal utility. In a real estate context, this would involve the cost of acquiring equivalent land and construction an equivalent new structure.

Unless undue time, inconvenience, and risk are involved, the price that a buyer would pay for the asset being valued would not be more than the cost of the modern equivalent. Often the asset being valued will be less attractive than the cost of the modern equivalent because of age or obsolescence.

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[19] Ibid.
[20] IVSC (2007), p. 32.

A depreciation adjustment is required to the replacement cost to reflect this." [21]

3.3.1.2.3 Income Capitalization Approach

"This comparative approach considers income and expense data relating to the property being valued and estimates value through a capitalization process. Capitalization relates income (usually a net income figure) and a defined value type by converting an income amount into a value estimate. This process may consider direct relationships (known as capitalization rates), yield or discount rates (reflecting measures of return on investment), or both. In general, the principle of substitution holds that the income stream which produces the highest return commensurate with a given level of risk leads to the most probable value figure." [22]

3.3.1.3 Guidance on Energy Efficiency Certificates

There are no standards, applications or guidance note that deal with Energy Efficiency Certificates or with Life Cycle Cost considerations.

In 2008 the International Valuation Standards Committee was converted in an International Board to deal not only with real estate but also with all other classes of assets. Therefore we assume that there won't be a new version of the IVS in due course.

3.3.2 RICS Valuation Standards

3.3.2.1 Introduction

The most recent version of the RICS Valuation Standards, the so-called “The Red Book”, is the sixth edition, which came into effect on 1 January 2008.

Like the IVSC the Royal Institution of Chartered Surveyors is based in London. The RICS Standards are mandatory to all 140.000 Chartered Surveyors - globally and not only to the UK members - therefore these standards have to be recognized as multinational standard as well.

3.3.2.2 Methodologies

Following the same basic concepts, as IVS there is no description of valuation approaches on the 122 pages of the global part of the RICS Valuation Standards. "The standards set a

[21] Ibid.
[22] Ibid.

framework for best practice in the execution and delivery of valuations for different purposes but do not instruct members how to value, nor do they discuss valuation methodology or techniques."[23]

3.3.2.3 Guidance on Energy Efficiency Certificates

The RICS Standards dealt only once with EPC. In Chapter 6.3.1 which is about the mortgage valuation specification in England and Wales. Surprisingly this paragraph read as follows: "In England and Wales, the valuer is not required to read … the Energy Performance Certificate, or comment on the energy or environmental ratings, unless specifically instructed to do so by the lender."[24]

It seems to be, that EPC are not relevant to valuations - at least not for lending purposes. There are not additional hints in the Red Book on those Certificates or on life cycle cost.

3.3.3 European Valuation Standards

3.3.3.1 Introduction

The European Group of Valuers' Associations, TEGoVA, issue the European Valuation Standards. TEGoVA is the European umbrella organization of 38 national valuers' associations in 27 countries. Its main objective is the creation and spreading of harmonized standards for valuation practice, for education and qualification as well as for corporate governance and ethics for valuers within Europe. The aim is to create a platform open to additional European countries, which would speak with a common voice on valuation to European legislators and policy-makers.[25]

The recent version of the European Valuation Standards (EVS) was released in 2003. A new version will be published in 2009. The following information is based on the draft of the EVS 2009 from May 2008. The EVS "[...] does not seek to change or dilute international standards but rather to add value to IVS in a European context.[26]

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[23] RICS (2008), p. 1.
[24] Ibid. p. 215.
[25] Cf. TEGoVA (2009), www.tegova.de.
[26] Ibid. p. 3.

3.3.3.2 Methodologies

Like the IVS and RICS standards the EVS do not deal with approaches: "EVS does not impose specific valuation methodologies as they are a matter for the professional judgment of the valuer in each case according to its circumstances".[27]

EVS 2009 is intended to be consistent with IVS published in 2007. They add valuation requirements and definitions of EU and EEA legislation. EVS consists of four 4 standards:

- EVS1: Market Value,
- EVS2: Valuation Bases Other than Market Value,
- EVS3: The Qualified Valuer and
- EVS4: The Valuation Process.[28]

3.3.3.3 Guidance on Energy Efficiency Certificates

The EVS do not make any reference to Energy Efficiency Certificates.

3.3.4 Conclusion

Even these latest of the three most commonly used multinational standards do not give any hint if and how to deal with energy efficiency or life cycle cost issues specifically at the moment.

3.4 National Standards

Although there are different international approaches for property valuation, each country has specific criteria and historically based specialities for valuing real estate. Therefore, in addition to the multinational standards, some selected national approaches - in alphabetical order - will be analysed in the following chapters.

3.4.1 Austria

The LBG (Liegenschaftsbewertungsgesetz) of 1992 in conjunction with the so-called ÖNORM B1802, organizes the valuation process and the methodologies in Austria. This

[27] Ibid. p. 5.
[28] Ibid. p. 2.

3.4.1.1 Value comparison approaches

The derivation of the value originates from real sales figures of comparable properties or buildings. The challenge in this obvious and plausible approach is the quality and applicability of the data. Therefore several adjustments for the individual qualities of the subject property concerning age, location, contractual matters and other value influencing factors can be done. Obviously it is difficult to find buildings, which are similar except for mass construction or the calculation of land values (see Figure 1 in chapter 3.2.1).

3.4.1.2 Cost related approach

The cost related approach is based on the replacement of construction costs, the value of other ancillary facilities and the land value. This methodology is normally used to calculate the value of residential property or special site facilities.

The replacement of construction costs includes the average costs per local size unit for the reproduction of a building, other facilities and eventually of additional belongings. In order to reflect the property's technical and economic age, depreciation has to be undertaken, whereas a wide range of methods are offered (e.g. Ross, linear or parabolic). Afterwards, appraiser has the possibility to take further adjustments into account to reflect the influences of additional values, structural or contractual damage. Added by the value of other ancillary facilities and the land value the properties' physical value is estimated, the value based on costs. Market-Adjustments have to be taken into consideration to get the market value. Figure 13 in chapter 3.5.4 illustrates the cost approach with the aid of a numerical example.

3.4.1.3 Income related approaches

The Austrian "Ertragswertverfahren" (compare Figure 5) is similar to the German (see section 3.4.2.2.3). The potential gross income is the annual income, which can effectively be achieved on the local property market, i.e. it can differ from the current rent contract.

I. Calculation of an internal rate of returns (IRR) with the aid of comparable properties.

II. Derivation of a sector specific rate with the aid of correlation and regression analyses.

III. Using inflation-adjusted rates of fixed-interest securities as basic rate and derivation of a “Liegenschaftszinssatz” by considering specialities of the real investment (risks and advantages).

After estimating the capitalisation rate the appraiser use a capitalisation factor, the present value factor to calculate the income Value of the building and its facilities. Afterwards, adjustments due to structural damage or deferred maintenance should be considered before adding the value of the land. Finally market adjustments may be taken into account.

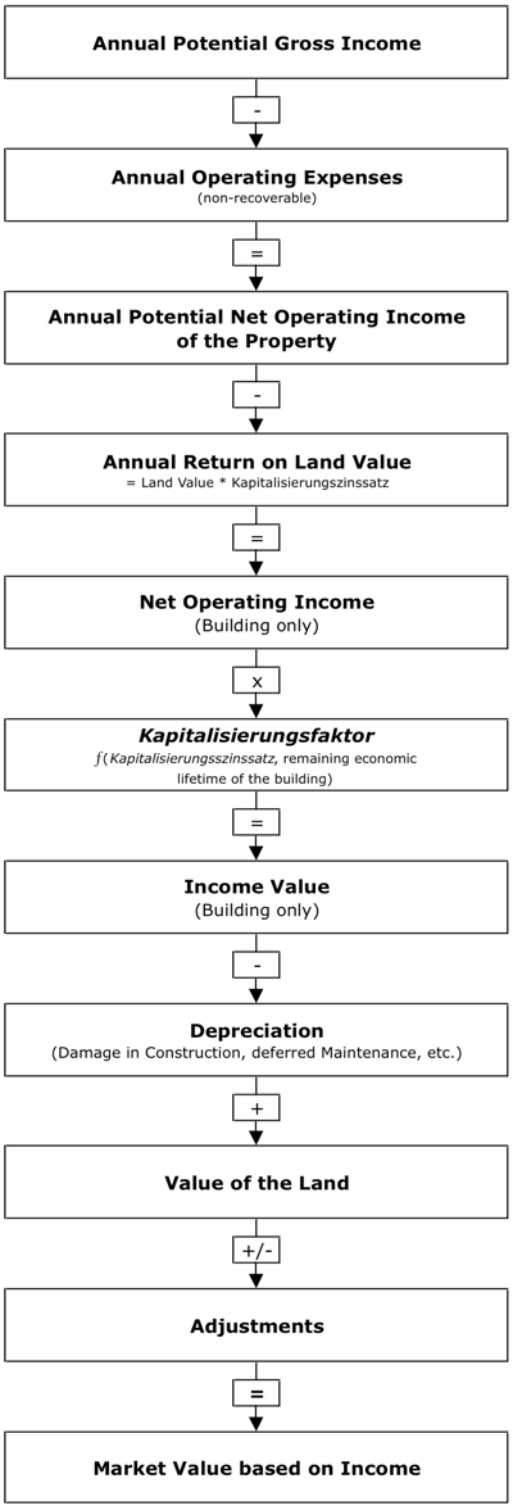

Figure 5: Austrian Income related Approach

Due to the requirements of international investors, the introduction of valuing with the aid of the Discounted Cash-Flow Method (see 3.2.3.2) in the "Liegenschaftsbewertungsgesetz" took place in January 2009, the so-called ÖNORM B1802-2.

3.4.2 Germany

3.4.2.1 Background

For Germany the market value is defined in § 194 of the "Baugesetzbuch", the German Statutory Code on Construction and Building. Besides being written in German it equals the market value definition given by IVSC/RICS/TEGoVA.[29]

In addition to this definition the valuation of properties follows the German regulation “Wertermittlungsverordnung“ (WertV) from 1988. In contrary to the IVS, RICS and TEGoVA and similar to the Austrians principles and general methodologies of property valuation are published here.

In 2007/2008 a board of professionals reviewed the WertV 1998. The results of the panel are supposed to guide to a new regulation due in midyear of 2009. Besides the adjustment to the international valuation requirements energetic characteristics have to be mentioned within the valuation practice for the first time.[30]

Otherwise there are principles like the discounted cash flow analysis or the residual valuation method that can be used in addition to the above-mentioned standards. The new ImmoWertV 2009 will include discounted cash flow analysis as a method of the income approach, but with a less precise description than in Austria.

In general German valuation is divided into two parts: the valuation of the land and the valuation of the building (and its facilities, which is directly connected to the property). In most cases the valuation of the land is done by indirect comparison to sales prices. The valuation of the building should be done by one of the following explained valuation approaches.

3.4.2.2 Methodology

3.4.2.2.1 Comparison Approach

The comparison approach - §§ 13 - 14 WertV - can be used in two different ways. First the appraiser can apply to a direct comparison. In most cases conditions for direct comparison

[29] Cf. Chapter 3.1, p. 11.
[30] Cf. Immobilienzeitung, 8 January 2009, p. 2.

cannot be achieved because most properties differ in a lot of characteristics. Valuers are used to choose the second way of the comparison approach, the indirect one.

3.4.2.2.1.1 Direct comparison approach

To use direct comparison German courts require the following conditions to be meet for unimproved property:

- Site (inner city, periphery, rural area)
- Situation of the property (terraced house, property at a corner, etc.)
- Structural and degree of utilisation (e. g. one storey residential building, multi-storey office building)
- Soil conditions (e. g. property on a slope)
- Layout and size of the land
- Degree of land development (e. g. access to the property)
- Local infrastructure (e. g. distance to bus or main station)
- Direction of the property
- Mixture of population within the local surrounding

For improved property the further conditions have to be compared to decide about the use of the comparison approach:

- Layout, size, age, using and construction level of the building

Properties are highly individual and the similarity needed for German courts hardly can be achieved. Besides proprietary or standardised terrace houses direct comparison fails because of the lack of similarities. Otherwise deviations have to be made via some adjustments.

A second issue for missing the application of direct comparison is the lack respectively the small quantity of real-time transaction cases.

3.4.2.2.1.2 Indirect Comparison Approach

Usually the indirect comparison approach is used for the valuation of the land. Therefore regional advisory committees (“Gutachterausschüsse”) are in charge to raise standard land values due to the transactions that were taking place in the local property market. The valuer

gets the opportunity for indirect comparison with averaged land values situated within the same location. Furthermore the administrative publish the averaged characteristics of the site like type of buildings in the area, size of area, etc. In addition to these typical local characteristics the valuer gets some special information of the regional properties. In some cases the appraiser has to fix the land value to get an objective real value of the land.

3.4.2.2.2 German cost approach

In general the cost approach - §§ 21 - 25 WertV - is used for properties, which are not targeted to achieve output. In most cases it is used for individual one-family homes or semidetached houses in Germany. At the lack of typical rents for local areas you can use cost related comparison approach for owner occupied factory buildings or warehouses. But the use of this approach should be checked for every single property.

To derive market value on basis of the asset value appraisers have to sum up the value of the building facilities and the calculated land value. In some cases there are special conditions like advantages of the location, which have to be reflected with extra adjustments.

The material asset of a property is composed of the value of the building, the value of the land and the value of the so called other facilities of the property. Figure 13 demonstrates the cost related approach in connection to a numerical example.

3.4.2.2.3 German Income Approach

The Income Approach is published in §§ 15 - 20 WertV.

To achieve the market value via the German income approach the income value of the building (and it's facilities) and the land value have to be calculated separately.

The German income value is based on the annual potential net rent income of the building. To maintain the annual potential net rent income you have to subtract the annual non-recoverable operating costs of the building and the annual return on the land value from the gross rent income.

According to § 18 WertV 1988 the depreciation is included in the German multiplier, the "Vervielfältiger". Figure 6 shows the calculation of the “Vervielfältiger”.

To gain the income value appraisers have to estimate a rate for properties. In Germany this special rate is called "Liegenschaftszinssatz". Valuers need it in connection with the

estimation of the remaining economic lifetime of the building to calculate the mentioned specific multiplier (Figure 6), which is used to derive the income value based on the annual potential net income.

$$\text{Vervielfältiger} = \frac{(1 + \text{Liegenschaftszinssatz})^n - 1}{(1 + \text{Liegenschaftszinssatz})^n \times \text{Liegenschaftszinssatz}}$$

$$V = \frac{1.0544^{80} - 1}{1.0544^{80} \times 0.0544}$$

$$V = \frac{68.2519}{3.7673} = 18.12$$

Figure 6: Calculation of the "Vervielfältiger", the specific German Multiplier

The German "Liegenschaftszinssatz" defined within § 11 WertV (§ 12 ImmoWertV) should be calculated in addition to the ongoing property transactions within the local respectively regional property market. In general the regional advisory committees, Gutachterausschüsse, have to cope with the publication of these rates for the different types of properties.

The last step is to ad the land value and to derive the market value from the calculated income value. Therefore the valuer has to check if any not mentioned circumstances effects the market value of the property. The appraiser has to account adjustments for e.g. over- or under rents, deferred maintenance or some other special value effecting characteristics of the property.

The left side in Figure 7 summarizes the procedural method of the German income approach in comparison to the following explained upcoming simplified income related approach of the new law "ImmoWertV" 2009.

3.4.2.2.4 German Income Approach - Version 2009

The adoption of the amended WertV is linked to the reformation of inheritance tax in Germany. In the midyear of 2009 the new law "ImmoWertV" will be valid.

The goal of the amendment is to become closer to the market due to transparent and comparable valuation results. The main difference to the income approach WertV 1988 will

be the possibility of using a simplified methodology, which was already recognized in the regulars of the WertR 2006.

This means the income value will be calculated without the annual return of the land. Instead Appraisers have to add the discounted land value, i.e. the present value of the land for the remaining economic lifetime of the building. This simplified approach will get the basic methodology.

In addition the new ordinance will imply the methodology of discounted cash flow for market valuation. On the right side of Figure 1 the simplified income approach is shown in comparison to the broad one of WertV 1988. The difference between the calculations accounts less than one per cent. Small variations like that are negligible in the valuers' profession.

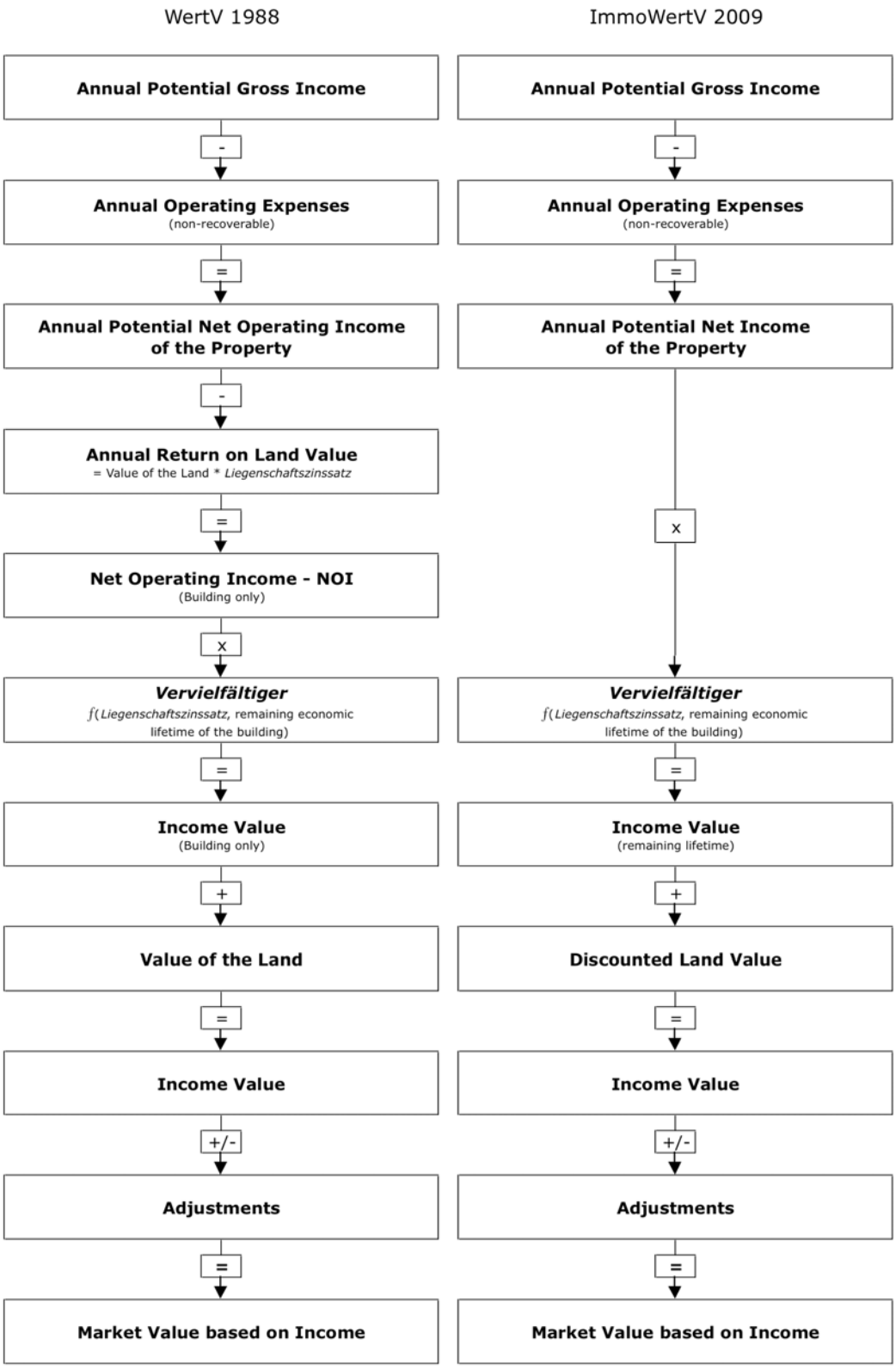

Figure 7: German Income Approach WertV 1988 vs. ImmoWertV 2009.

3.4.2.3 Guidance on Energy Efficiency Certificates

The comments of the draft mention, that including the energetic characteristics of a building represents the increased importance of climate change and the possibility of an impact to the property value in the future.[31] Concluding the new regularities declare that valuers have to be aware of possible impacts resulting from energy efficient building characteristics.

3.4.2.4 Conclusion

The actual draft of the new regularities of ImmoWertV 2009 suggests taking characteristics of energy efficiency as one characteristic of a property into account.[32] No specific hints, how to deal with EPC or LCC were given.

3.4.3 Norway

3.4.3.1 Introduction

In Norway no public requirements regulating the valuation businesses have been installed, therefore the Norges Takseringsforbund has taken the responsibility of developing the professional standards and the ethical rules governing the valuation business as well as the surveying business in the country. The valuation methodology is based on the framework of the TEGoVA, which is presented in 3.3.3.

The Norges Takseringsforbund is a unification of several professional valuers and surveyors having the responsibility of developing and maintaining several sides of the professional framework for the valuation profession. They are particularly responsible for the standards and that these are constantly adapted to the needs of the market, the international standard of TEGoVA (The European Group of Valuers Associations) and to those of IVSC (The International Valuers Standards Committee). Based on the framework developed in TEGoVA, the Norges Takseringsforbund committees are also responsible for developing the specifications for the Norges Takseringsforbund compulsory program of CPD (Continued Professional Development), of which extensive training programs is a part. A focus is thereby laid on independence and objectivity. Another key responsibility and the Norges

[31] Ibid. p. 48.
[32] Cf. Draft ImmoWertV (2008), section 6 (5), p. 8.

Takseringsforbund committees is to develop specifications for all standardised report forms and the professional requirements tied to each of these. This includes specifications for the computer programs required to produce the reports, a recognition of the fact that the reports quality also can be measured by the quality of how it is produced. (Source: Norges Takseringsforbund)

3.4.3.2 Methodology

Therefore the valuation methods in Norway can be summarized in the TEGoVA's methodologies - as described in chapter 3.3.3.

3.4.3.2.1 Comparison approach

In Norway the comparison approach is used mainly for the valuation of residential property representing about 80% of the valuation market. It is assisted by the cost approach.

3.4.3.2.2 Cost approach

The cost approach is in general only used as a "reference value" for the valuation of residential and commercial real estate.)

3.4.3.3 Income approach

The income approach is used for the valuation of commercial real estate representing about 20% of the valuation market.

3.4.3.4 Guidance on Energy Efficiency Certificates

The Norwegian Rules respectively the used EVS do not make any reference to Energy Efficiency Certificates.

3.4.4 Romania

3.4.4.1 Introduction

In Romania, assessment work is required for an extensive range of purposes: real estate sales, lawful (claim for compensation, expropriation, inheritance, litigation, disputes between shareholders, etc.), liquidation of companies, mergers or divisions of companies, insurance

policy, etc. The purpose of the valuation is essential to identify the type of value to be estimated and the methods to be used for it.

Romanian national valuation standards are in agreement with the International Valuation Standards. Actually Romanian valuers use a translation of the 8th edition of the International Valuation Standards - IVS 2007 nowadays as a basic document.

The appraisal of real estate is also according to the international methodology. Romanian valuers currently use a translation made by the National Association of Romanian Valuers of the book “Appraisal of Real Estate”, edited by Appraisal Institute USA, edition 2001.

3.4.4.2 Methodology

According to the specific conditions and the purpose, the valuation of real estate is based primarily on the three approaches.

3.4.4.2.1 Sales comparison approach

In Romania, the method is applied using direct comparison by looking at a minimum of at least three identified comparable transactions that were sold on the open market.)

3.4.4.2.2 Cost approach

This approach is rarely used in Romania, lately.

3.4.4.2.3 Income capitalisation approach

Usually in Romania, appraisers study five or more properties for which an active rental market exists.

3.4.4.3 Conclusion

Usually a valuation report should contain at least two of the approaches. No hints were given, how to deal with Energy Efficiency Certificates or Life Cycle Cost Approaches.

3.4.5 United Kingdom

3.4.5.1 Introduction

In the UK five different methods are used in practice. Four of them, the comparative, the investment, the residual and the profits method are normally used for on the market-traded assets. The fifth, the cost approach, only could be used in restricted purposes.[33]

The residual method is used for the valuation of development sites and redevelopment of existing properties.[34] The profit method lost reliance due to the increasing number of transactions and therefore the existing number of comparables.[35] These two methods should only be mentioned but will not be established within the following explanations.

3.4.5.2 The Methodology

3.4.5.2.1 The Comparative Method

In the case similar characteristics to the valuable property and present transaction data valuers are able to compare prices to find a value. The skill is to realise adjustments to reflect differences between the comparable properties and the property being valued.[36] This approach is used for residential properties like three-bedroom houses and agricultural land.[37]

Within the valuation of commercial properties the method transmit background information about the property being valued. This methodology is unlikely to be used as a standalone valuation method in the UK.[38]

3.4.5.2.2 The Cost Approach

The methodology of the cost approach is used for owner occupied properties. By the lack of usable transactions a valuation based on costs is used i.e. for properties, which are not normally bought or sold.[39] The assumption for the use of the cost approach is that a property is only a part of a running business, in an accountancy context. This approach is used in

[33] Cf. Sayce et al. (2006), p. 12, Gelbtuch (1997), p. 33 et seqq.
[34] Cf. Sayce et al. (2006), p. 14., Gelbtuch (1997), p. 39.
[35] Cf. Sayce et al. (2006), p. 15.
[36] Gelbtuch (1997), p. 33.
[37] Sayce et al. (2006), p. 13.
[38] Ibid.
[39] Gelbtuch (1997), p. 38.

private and public sectors. Within the UK the use is restricted to book or company accounting and statutory purposes (e. g. taxation).[40]

The value of the property consists of the rebuilding costs and the land value. The land value is calculated by comparison approach. The building is valued to determine the depreciated replacement costs of the building. The costs are estimated as a normally substitute building in relation to the remaining economic lifetime of the actual building. The asset value is the summed up land value and depreciated replacement costs.[41]

3.4.5.2.3 The Investment Method

The investment method is used for properties that produce a rental income. It is the main methodology for the valuation of commercial property in the UK.[42] Valuers are using the today's terms of the net income for estimating the currently and in the future generated revenues. The valuation yield (multiplier) implies risks and property-specific characteristics derived. The estimated annual rental income of the future is discounted to arrive today's value. In general you can compare it to the income approach at all.[43]

Basically it is comparable to the mentioned cost approaches in the above-mentioned chapters.

3.4.5.3 Guidance on Energy Efficiency Certificates

UK valuation is based on the RICS Standard, which - as mentioned - dealt only once with Energy Performance Certificates: In the “Red Book’s” Chapter 6.3.1 which is about the mortgage valuation specification in England and Wales. Surprisingly this paragraph read as follows: "In England and Wales, the valuer is not required to read … the Energy Performance Certificate, or comment on the energy or environmental ratings, unless specifically instructed to do so by the lender."[44]

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[40] Sayce et al. (2006), p. 15.
[41] Ibid. p. 16.
[42] Cf. Sayce et al. (2006), p. 13, Gelbtuch (1997), p. 34.
[43] Cf. Sayce et al. (2006), p. 13. et seqq.
[44] RICS (2007), p. 215.

3.4.5.4 Conclusion

Whether the national nor the international described valuation methods, standards and laws are mentioning EPC or LCC aspects until nowadays. So in practice energy efficient and non-efficient buildings are valued in equal measure even though there might be differences.

3.5 Comparison of the Valuation Methodologies

3.5.1 Introduction

As shown in the previous chapters the valuation methodology differs only slightly from country to country but is based on the same principles. To make a comparison easy numerical examples will be given in Chapter 3.5.4.

For a better understanding of the similarities and differences the definitions of the most used terms, especially the different understanding of yield and rates, is given before.

3.5.2 Definitions of Yields and Rates

The most common used term for the interest rate used in the income approaches are yield and rate.

In general a yield or rate is calculated as shown in Figure 8.

$$\text{Yield} = \frac{\text{Annual Income}}{\text{Value}}$$

$$Y = \frac{I}{V}$$

$$Y = \frac{150\,000}{2\,200\,000} = 6.80\%$$

Figure 8: General Concept of Yields

But these terms have to be distinguished in more than one dimension: Firstly there are “gross yields” and “net yields”; secondly there are yields that reflect the expected rental growth (“equated yields”) and those which do not reflect the rental growth, because this is reflected in the nominal amounts of the rents (“equivalent yields“) and thirdly there are different yield

terms for the point in time or period of time they are used for (i.e. “initial yield”; “reversionary yield”; “exit yield”; “internal rate of return”).

3.5.2.1 Gross and Net Yields

The result in the numerical example in Figure 8, 6,80%, refers to a gross yield, if 150 000 € is considered to be the gross revenue per year.

Instead of a gross yield a net yield is used very often. In this case the annual revenue is net and because of this annual operating costs have to be deducted. If the operating costs will be 30 000 € per year the net income equals 120 000 €. To get the net yield the divisor is changed to sales price plus purchasing costs, which might be 6,00% of the purchase price. Because the net yield is very often used when a property is purchased, it is mostly the Net Initial Yield as shown in Figure 9.

$$\text{Net Initial Yield} = \frac{\text{Net Operating Income}}{\text{Net Sales Price + Purchase Costs}}$$

$$\text{NIY} = \frac{\text{NOI}}{\text{Gross Sales Price}}$$

$$\text{NIY} = \frac{150\,000 - 30\,000}{2\,200\,000 + 132\,000} = 5.15\%$$

Figure 9: Net Initial Yields [NIY]

3.5.2.2 Initial Yields, Reversionary Yields and Exit Yields

Yields can also be differentiated according to point in time they are calculated for. The yield calculated for the purchase or to be more general the valuation date is called initial yield. Often, if there are significant changes of the rents known at a specific point in time, the yield calculated with the new rent is called reversionary yield. If used in the DCF model the yield used for the sale of the property is called exit yield.

3.5.2.3 Equated and Equivalent Yields

Yields have further to be distinguished between those that reflect annual changes due to the inflation directly within the yield („equivalent yields“) and those yields where the inflation is reflected in the annual amounts of rents and costs („equated yields“).

The net initial yield, the DCF´s exit yield or the German „Liegenschaftszinssatz“ are equivalent yields; but the DCF´s discount rate is an equated yield.

3.5.3 Definitions of Multipliers

In general the multiplier is just reciprocal value of the (initial) yield, which can be net or gross.

If the Net Initial Yield [NIY] is used the multiplier is called “Year’s Purchase” [YP] and is calculated as shown in Figure 10.

$$YP = \frac{1}{Yield} = \frac{1}{5.50\%} = 18.18$$

Figure 10: Calculation of Year’s Purchase [YP]

Using the reciprocal value of the yields implies that the rents will be paid unendingly and therefore the building will last for perpetuity. In some jurisdiction this paradox assumption is denied and therefore the multiplier has to be calculated using the remaining economic lifetime of the building, which makes the formulary look a little bit more complicated as shown in Figure 11. For this special kind of multiplier the German term “Vervielfältiger” will be used in this paper.

$$Vervielfältiger = \frac{(1 + Liegenschaftszinssatz)^n - 1}{(1 + Liegenschaftszinssatz)^n \times Liegenschaftszinssatz}$$

$$V = \frac{1.055^{80} - 1}{1.055^{80} \times 0.055}$$

$$V = \frac{71.4764}{3.9862} = 17.93$$

Figure 11: Calculation of Vervielfältiger [V]

As shown in the Figure 10 and Figure 11 “Year’s Purchase” and “Vervielfältiger” differ, if the same nominal yield is used. To reflect the market situations in a right way, it is obvious that different yields (e.g. “net initial yield” versus “Liegenschaftszinssatz”) have to be used, which meant that the necessary yields have to be derived from the markets in the same manner than they will be used in the formulas.

3.5.4 Examples

The following numerical examples are gathered for a better understanding of the overall approaches and the existing differences.

Global Assumptions for a good shaped office building in an average city location:

• Rentable Area	1 500 m²
• Annual Rental Income	150 000 €
• Non-recoverable operating expenses	30 000 €
• Land Value	500 000 €
• "Liegenschaftszinssatz"[45]	5.44 %
• Yield or Capitalization Rate	5.50 %
• Replacement costs	1 750 €/m²
• Comparable Sales Prices	1 450 €/m²
• Remaining economic lifetime of the building	80 years
• Age of the building	20 years
• Buildings are sold for 85% of the value derived from costs.	
• No special constructional damage, significant deferred maintenance.	

3.5.4.1 Comparison Approach

Generally the analyses of all available sales prices within the property market result in an applicable sales price per rentable size unit. The challenge within the use of the comparison approach is the assessment and the applicability of the different sales prices. Basically statistical analyses like variation and/or regression analyses have to be done. The calculation of the comparison approach is as simple as demonstrated in Figure 12.

[45] The calculation of the market value with the aid of the income related approach uses an equated "Liegenschaftszinssatz" respectively "Kapitalisierungszinssatz" to obtain the comparability of the results.

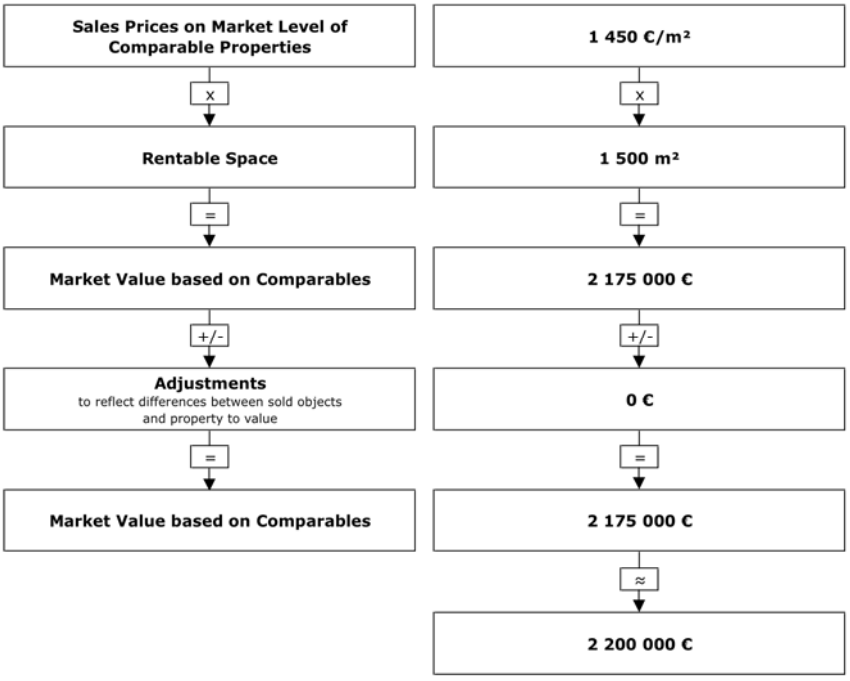

Figure 12: Example of calculating Market Value - the Comparison Approach

3.5.4.2 Cost Approach

The cost approach demonstrates the costs of replacement for the building being valued. In very few cases cost approach is able to reflect market. Nevertheless it is still a used and accepted valuation approach in many countries. Generally they are calculated as Figure 13 demonstrates.

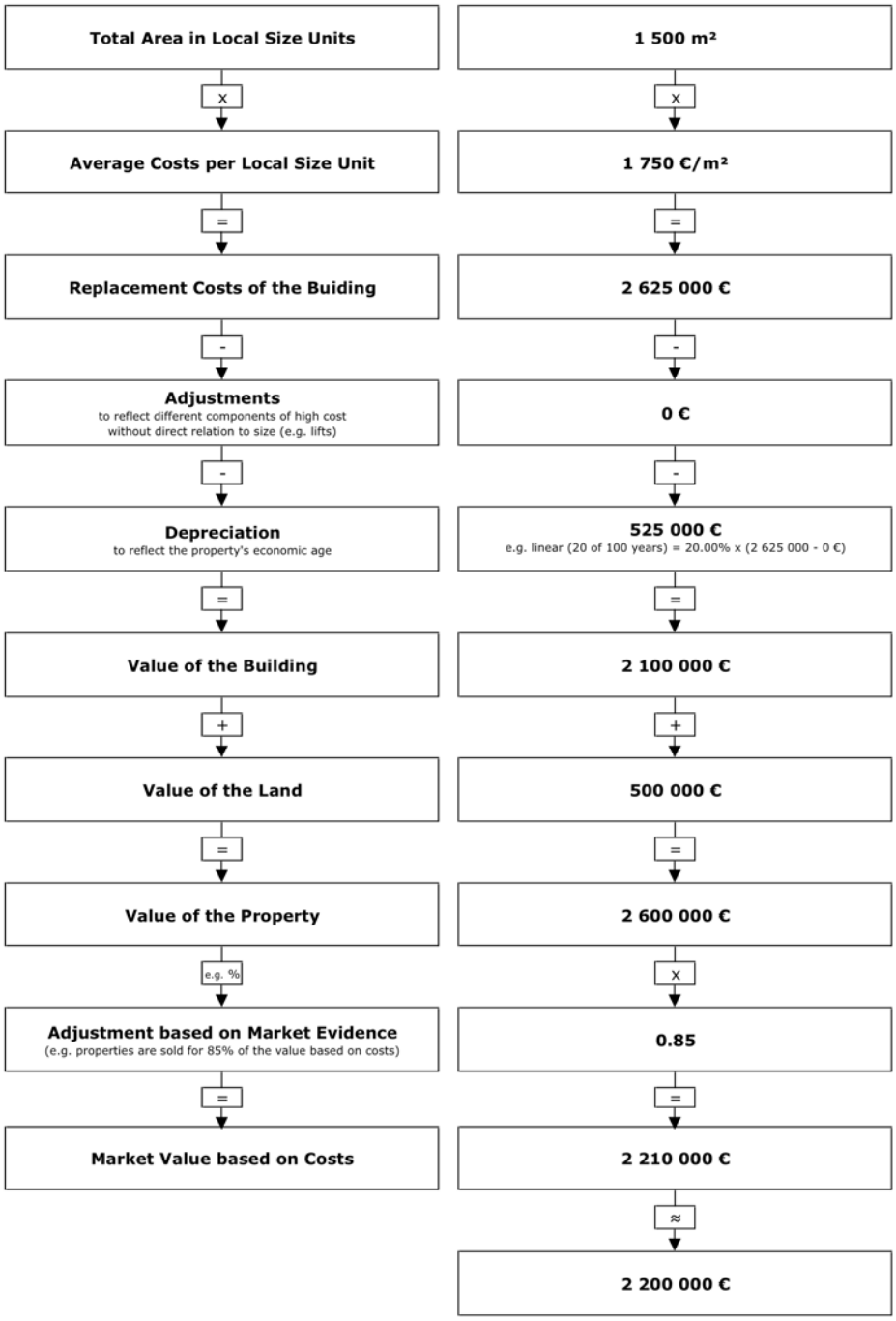

Figure 13: Example of calculating Market Value based on Costs

3.5.4.3 Income related Approaches

3.5.4.3.1 Direct Capitalization

The income related approaches mentioned in the explanations above feature some differences. The examples of the different ways of calculation in Figure 14 may clarify some misunderstandings.

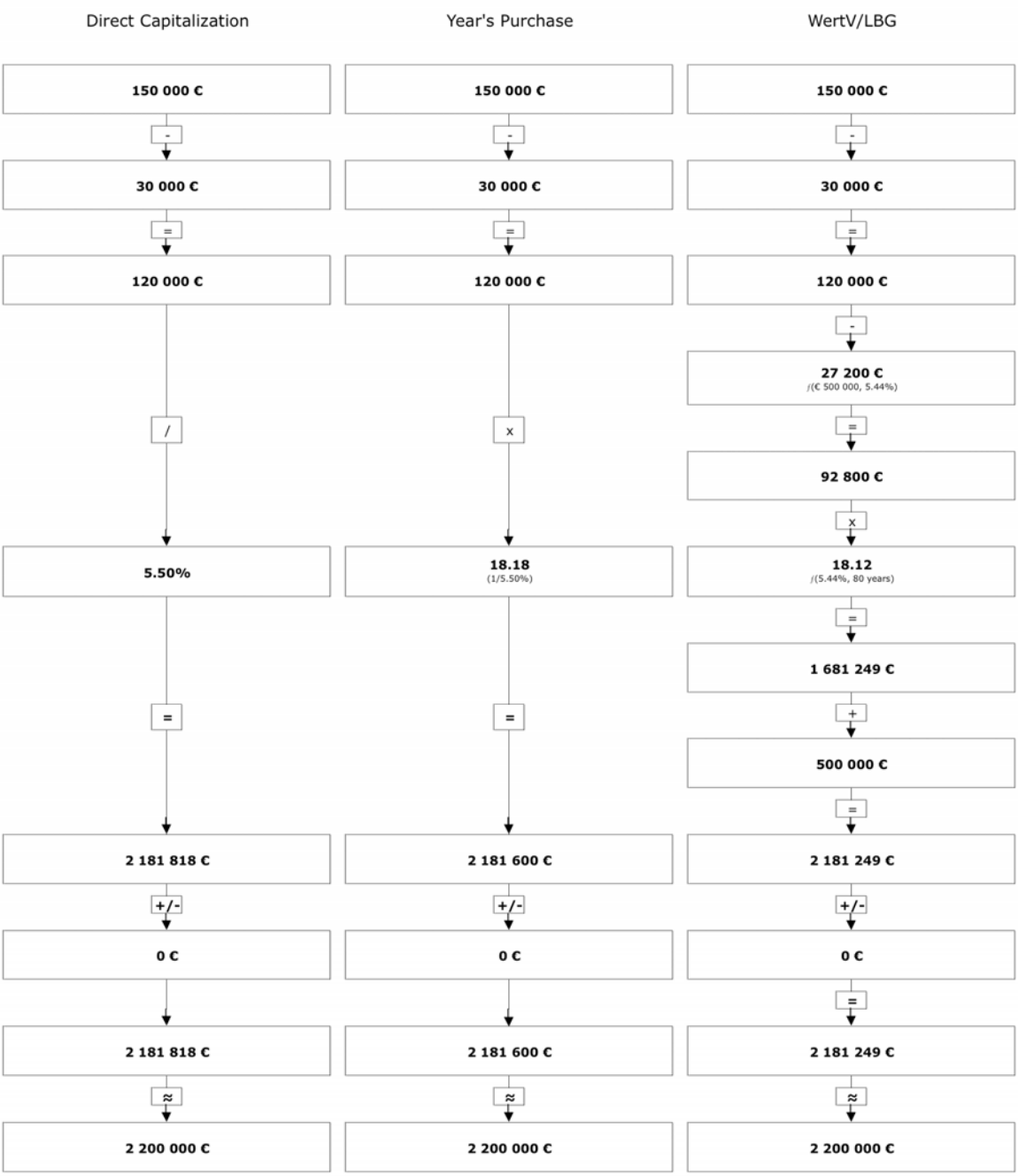

Figure 14: Example of different international Income Approaches

The methods of year's purchase and direct capitalization, which were already mentioned in 3.2.3.1 are mathematically totally the same. Due to the rounded multiplier used in year's purchase calculation the results differ about € 218. If the calculation would take place non-rounded multiplier results would be the same. In comparison the German and Austrian calculation seems more complicated. The main difference is the way of accounting the risk of the building being valued. While the calculation in Germany/Austria reflects risks within the

The following principles describe the connection of “Liegenschaftszinssatz” and yield:

- The shorter the remaining economic lifetime of a building being valued the more the gap between “Liegenschaftszinssatz” and yield increase respectively in the contrary for long remaining economic lifetimes of buildings the yield converge to the “Liegenschaftszinssatz”.

  If the building for example would have simply 30 years of remaining economic lifetime the “Liegenschaftszinssatz” remain stable (including the risk of the shorter economic lifetime) and the yield would increase about 0.77 percentage points to 6.27%. Within the calculated example it is shown that the gap between the yield and the “Liegenschaftszinssatz” only amounts 0.06% for the remaining economic lifetime of 100 years.

- For German and Austrian valuation it is essential that the smaller the value percentage of the land the more unimportant is the effect of the land value.

3.5.4.3.2 DCF

Compared to the calculations above a numerical example of the DCF will finish this section.

[46] “Liegenschaftszinssatz”/”Kapitalisierungszinssatz” are used synonymous for the upcoming explanation.

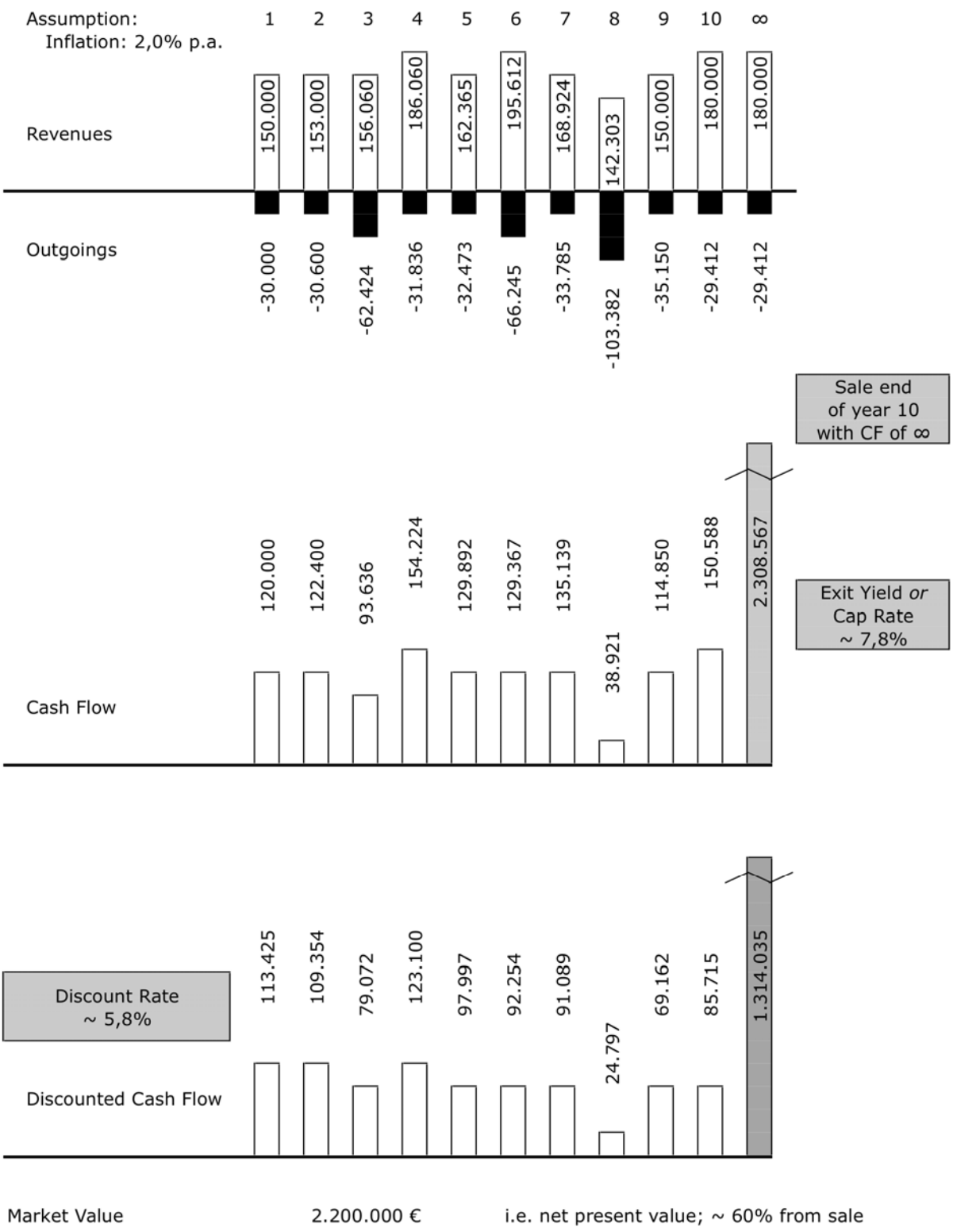

Figure 15: Example of the DCF

Closing the chapter overview of international current used valuation methodology a short summary will gather the main facts and will assess the consideration of energy efficient characteristics of buildings.

3.6 Conclusion

Comparing the presented valuation approaches a similar understanding for the value of a building respectively a property can be determined generally. In the most cases valuation is seen as an estimation of the most likely selling price on the open market.

The valuation methodologies of all the analysed countries are mainly based on the three valuation methodologies, the comparison approach, the income approach and the cost approach. They possess little differences that can be disregarded for the further work of this report.

But every international acting appraiser have to consider the national law and especially valuation practice peculiarities of the country in which a building may be valued.

Furthermore some hints of considering energy efficient building characteristics were given (see chapter 3.4.2.3). Vice versa e.g. “The Red Book” permit appraisers to ignore an existing EPC for buildings being valued in England and Wales (see 3.3.2.3). In contrary RICS currently published a valuation information paper, which is dealing with integrating sustainability of buildings into the process of commercial property valuation.[47] The attention increased and the development will further go on in this direction.

The international main challenge is to find the fundamental differences between energy efficient and non-efficient buildings. Many researchers are predicting that values will be higher if buildings are more energy efficient than others[48], but a widespread job is to get empirical evidence out of the property markets.[49] The following chapter gather some first practice of “green” valuation respectively shows running research projects.

[47] Cf.RICS (2008): p. 1.
[48] Cf. DTZ Research (2005), RICS (2005), Bowman, R., Wills, J. (2008).
[49] Muldavin, S. (2008), p. 15.

4 International Experience with Energy Performance within Property Valuation Practice

In the following chapter, a short overview of recent state of the science in international approaches regarding the integration of sustainability, energy performance and energy efficiency of buildings in the valuation methods is analyzed. Due to the maturity of the markets and the availability of most qualified data so far, this chapter shed lights on developments in Australia, USA, Germany and UK.

4.1 Experience outside Europe

4.1.1 Australia

4.1.1.1 Australian Property Valuation Practice

The Australian property valuation practice follows the national standard and guidance for property valuation ("Australian and New Zealand Valuation and Property Standards"), which are published by the "Australian Property Institute" (API) and the "Property Institute of New Zealand" (PINZ).[50] Furthermore the Valuation Standards of the RICS[51] are as well a key standard for Australian property appraisers.

The Australian property valuation practice and standards are fundamentally compliant to the international valuation standards (IVS, see Chapter 3.3.1).

4.1.1.2 Explanatory Notes Regarding the Green Star Rating System

Due to the intensive links to the UK practise (because of commonwealth) as well as the fact that there are a lot of Australian based institutional investors and world-wide active listed companies the Australian professionals are in general very advanced in terms of tools, methods and general market transparency.

Australia is currently one of the few countries, which is already heading the aim to allocate the market impact of energy efficiency and performance of buildings within the real estate

[50] Cf. API, PINZ (2008).
[51] See chapter 3.3.2.

market, as well as the integration possibilities of such aspects into the property valuation practise[52].

Therefore the basis to allocate "Environmental Sustainable Design" (ESD) performance of buildings for integration into property valuation practice mostly refers to the national environmental rating tool "Green Star™", which was established by the Green Building Council of Australia (GBCA) already in 2001 and tracked an rapidly growing in use and relevance in the Australian real estate market over the last few years.

The most common and applied green building rating tool is as stated before the Green Star Rating System of the GBCA, which is relatively similar to other worldwide renowned rating tools such as the US-American "LEED®" (Leadership in Energy and Environmental Design), British "BREEAM" (Building Research Establishment Environmental Assessment Method), or the Japanese "CASBEE" (Comprehensive Assessment System for Building Environmental Efficiency).

Following the definition of GBCA, a Green Star building is defined as

> *"[…] a property that incorporates design, construction and operational practices that significantly reduce or eliminate the negative impact of development on the environment and occupants. A Green Star building is a building that achieves a Green Star rating of four or more stars."*[53]

The Green Star rating system therefore focuses on environmental initiatives of project facing the following environmental impact categories:

- Energy efficiency,
- Water efficiency,
- Indoor environment quality,
- Material selection,
- Land use ecology,
- Emissions, and
- Innovation.

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[52] Cf Bowman, R., Wills, J. (2008).
[53] Cf Bowman, R., Wills, J. (2008).

For reaching specific standards of each above-mentioned category, which are pre-weighted, the building receives one point. Based on the number of points the building achieve in total, it will be classified as a “4 star” (best practice), “5 star” (Australian excellence) or “6 star” (world leadership) property.[54]

4.1.1.3 Developed Green Property Valuation Methodology

Australian property appraisers and national institutions, which are heading the topic, as well commonly stated the DCF-Methodology (compare Figure 4) as the most suitable approach for valuing green and sustainable buildings and are adequate to assess the value contribution of Green Star buildings. The suitability of DCF might attribute to the fact that Green Star buildings are income-producing properties generally.[55]

The reason for that is because this methodology is the most transparent valuation approach, which allows appraiser to consider and reflect all relevant aspects and opens a broader range of possibilities for adjustments and modelling of key valuation parameters such as rental growth, renew/re-lease probability and vacancy, operating expenses, capital expenditure and terminal yields, operating expenses (see Figure 16). Due to that also the possibility for integration and modelling of different effects of energy performance and sustainability indicators are more transparent in comparison to other valuation approaches (e.g. sales comparison or cost related approach).[56]

[54] Further and extensive information regarding the Green Star Rating System can be found on www.gbca.org.au.
[55] Cf Bowman, R., Wills, J. (2008), p. 11.
[56] Cf Bowman, R., Wills, J. (2008), p. 22.

	Variable	Possible Change due to Green Star Label
Cash Flow	Net Rent	Achievable net rent may increase. This will increase cash flow from asset and thereby the properties value as well.
	Outgoings	Operational expenses, etc. may decrease.
	Capital Expenditures	Conventíonal buildings may be forced to upgrade to Green Star standard.
	Lease Term	Green Star buildings may attract longer lease terms.
Yield	Discount Rate	Investors may consider lower risk premium.
	Growth Rates	Higher growth rate may exist in comparison to conventional buildings.
Exit Value	Depreciation	Lower depreciation and reduced level of obsolescene may contribute to higher level of Exit Value.

Figure 16: Key DCF-Variables, which influences Market Value of Green Star buildings[57]

Anyways investigation, detailed scheme or practical guidance how environmental sustainable performance indicators are integrated into property valuation practice does not exist at the moment, nor does Australian property appraisers consider and taking such aspects into account in current valuation practice so far. Furthermore it is not clear which assumptions within that approach are being effected by green building initiatives. This is also caused by the fact that the lack of market data is still high and a critical point and can only be addressed over time.

4.1.1.4 Impacts of Energy Performance and Sustainability on Property Value

According to a survey by the Green Building Council of Australia profound numerous impacts of energy performance and sustainability on property value are not available at present. However the report stated, that according to the survey the industry expectation is

[57] Cf Bowman, R., Wills, J. (2008), p. 23.

that long term rental growth, operating cost savings, improved occupancy rates and tenant retention will become the key drivers for the market value of Green Star buildings in relation to non-Green Star buildings in Australia (see Figure 17). On the other hand the survey indicates that a number of studies show still significant, slight cost premiums to the construction and design of green buildings.

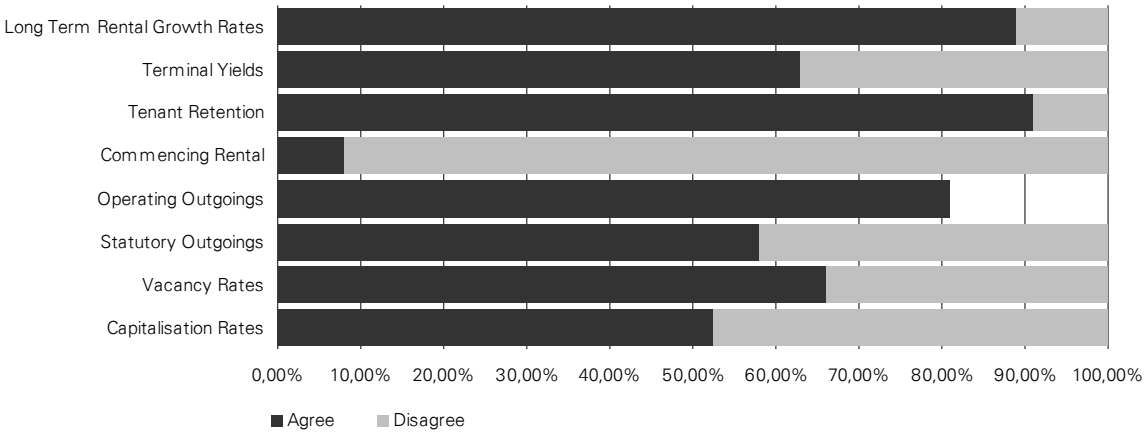

Figure 17: Market impact of Green Buildings[58]

Due to the fact that historical data about the impact of energy performances on the market value of properties is currently not available, just scientific researches and sensitivity analyses by the Green Building Council of Australia[59] or Queensland University of Technology[60] tries to quantify evidence of the possible impact of sustainability and energy performance indicators on the value of properties.

Recent sensitivity modelling by the Green Building Council of Australia for example shows that market value is most sensitive to movements in rental growth.[61] Thus results in a decrease of rental growth by 1.5 % and property value by around 0.15 % in case of non-Green Star buildings, which are failing to compete with Green Star buildings. The case study also reflected, that in few examples Green Star buildings in Australia may have achieved a reduced capitalization rate in a range between 25 to 50 base points in comparison to conventional properties.

[58] Cf. Bowman, R., Wills, J. (2008).
[59] Cf. Bowman, R., Wills, J. (2008).
[60] Cf. Boyd, T. (2005).
[61] Cf. Bowman, R., Wills, J. (2008).

While these studies provide evidence of value and cost impact of green buildings, they are not numerous enough so far to extrapolate general rules for valuation practice at the moment. Furthermore as Warren (2009) stated correctly the basis on which this analyses of currently certified buildings were carried out still covers a relatively small proportion of the total Australian real estate market from which they try to get evidence.[62] Anyway they show that efforts to quantify the benefits of green buildings are underway and it is just a matter of time until tangible and profound information and evidence will be available.

Due to the possibility of potential linkages between Green Star rating indicators and property valuation, there are no practical schemes or practical guidance available at the moment, which state the link of possible integration of energy efficiency or LCC indicators derived from Green Star ratings into property valuation.

4.1.2 United States of America

The following chapter is dealing with the US property appraisal. First the valuation practice, used standards and methods will be figured out. Afterwards a summary of efforts and first experiences of taking energy efficiency aspects, the “green”, i.e. sustainable features of buildings within the property markets of the United States of America into account of property values.

4.1.2.1 US Property Valuation Practice

In the USA the Appraisal Institute, a global association of professional real estate appraisers, governs the valuation practice of property valuation. It was founded in 1932 and got 24 000 members in 91 chapters throughout the world.[63]

"Our mission is to advance professionalism and ethics, global standards, methodologies, and practices through the professional development of property economics worldwide."[64]

The Appraisal Standards Board (ASB) of the Appraisal Foundation is developing, publishing, interpreting and amending the Uniform Standards of Professional Appraisal Practice

[62] Cf. Warren, C. (2009), p.8.
[63] Cf. www.appraisalinstitute.org/about/.
[64] Ibid.

(USPAP). The current edition 2008-2009 is effective from January first, 2008 through December 31, 2009.[65]

To comply with USPAP the appraisers have to "be aware of, understand, and correctly employ those recognised methods and techniques that are necessary to produce a credible appraisal [...]".[66] Therefore the appraiser has to analyse and "[...] develop an opinion of highest and best use [...]".[67]

4.1.2.1.1 Sales Comparison Approach

By using the sales comparison approach the valuer derive market value by comparing the property to similar properties which have been sold respectively are offered for sale. The basic principle for the comparison approach is the principle of substitution. [68]

Basically the appraiser use the term of rentable area, quoted on the price per square foot. Land values are expressed as price per square foot, per acre or per square foot of permissible building area.[69]

The comparison approach is also used to check the results of the income approach. It is unusual to value a large investment-grade property solely on the basis of comparison approach.[70]

4.1.2.1.2 Cost approach

In the United States the cost approach is the most applicable to special purpose-buildings like schools or churches. But the cost approach becomes controversial as mainstream appraising method but it is still a recognized valuation method.[71]

Basically the valuer sum up the land value, the replacement costs and the entrepreneurial costs. Afterwards the appraiser subtract depreciations e.g. because of the age of the building to get the Value based on cost approach.[72]

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[65] Appraisal Standards Board (2008), p U-i.
[66] Appraisal Standards Board (2008), p. U-15.
[67] Ibid. p. U-17 et seqq.
[68] Ibid. p. 15 et seqq.
[69] Gelbtuch (1997), p. 16.
[70] Ibid.
[71] Ibid.
[72] Appraisal Institute (2008a), p.378.

4.1.2.1.3 Income Approach

Income-producing properties are valued by the principle of anticipation "[...] value is the present worth of future benefits".[73] American appraisers have to differ between direct capitalization and discounted cash-flow analysis.[74]

By the knowledge and understanding of the marketplace the valuer estimates revenues and expenses of the property for a single year or an accepted period of holding. The annual estimated revenues subtracted by the calculated expenses result in the so-called Net Operating Income (NOI). This method is called direct capitalization and is used in advance for properties with long-term, level cash flows.[75]

Otherwise the appraiser can calculate the expected annual cash flows commonly on a 10-year holding period for DCF analysis. It is assumed that the proprietor will receive 10 years of revenues and then the property will be sold. The sales price is calculated by using a capitalisation rate to the estimated NOI for the eleventh year. The present value results by the sum of the discounted annual cash flows and the estimated sales price.[76]

4.1.2.2 US approaches of Green Property Valuation

In the USA the first precise recognition and undertakings of the importance of linking sustainable and green issues (e.g. energy performance) to the property valuation process goes back to the late 90's and beginnings of the 21st century where the "NYSERDA" (New York State Energy Research and Development Authority) and the "Institute for Market Transformation" (IMT) have supported a project which main objective was to encourage and sensitize property appraisers to account building energy performance as a factor and impact on cash flow and value of properties. The NYSERDA was as well one of the first institutions which offered special workshops to transfer energy issues as well as inform appraisers in general about the green building benchmarking tools such as "Energy Star®" or "LEED®".[77] Another mentionable US-American green building rating tool in this context, which competes

[73] Gelbtuch (1997), p. 11.
[74] Gelbtuch (1997), p. 17.
[75] Gelbtuch (1997), p. 11 et seqq.
[76] Ibid.
[77] Cf. Institute for Market Transformation (2003).

with Energy Star and LEED, is the online auditing tool "Green Globes™" of the Green Building Initiative, which offers a more simple methodology.

One of the recent key players who drive and boost the recognition and importance of green property valuation issues in the USA is the already mentioned AI, which offers currently specific education programs according to that issue to spread out awareness and knowledge to the US property appraisal profession. In detail this approaches, as it was stated as well in Chapter 4.1.1, refers to integrating green building rating tools (e.g. Energy Star or LEED) in application of current traditional valuation methods such as cost, income or sales comparison approach. In 2002 Khan went one step further and adds as well energy performance certificate as adequate and another possibility for information which could be integrated in property appraisal practice.[78]

Other investigation on possible green property valuation by Pitts and Jackson also stated that property appraisers need to adjust current property valuation methods to be able to integrate green property features in their valuation process.[79] Furthermore they address that the sales comparison approach would be appropriate for valuing green buildings, but it is still problematically to find a broad range of sales comparables in current real estate markets at the moment.[80]

Regarding the cost approach it seems as well at the first sight that this method is suitable for valuation of green buildings, because differences in reproduction or replacement costs of conventional and green buildings should be available. But two facts may drawback this idea as quick as it arose:

- The traditional cost approach just reflects the construction cost and may ignore benefits from green property features.
- Acquirer may not be willing to pay the full cost premiums of green buildings.[81]

In addition according to several studies e.g. the "World Business Council on Sustainable Development" (WBCSD) the current average cost premium for integrating green features into

[78] Cf. Khan, A. (2002), p. 6 et seqq.
[79] Cf. Pitts, J., Jackson, T. (2008), p. 116.
[80] Cf. Pitts, J., Jackson, T. (2008), p. 117.
[81] Ibid.

new buildings was overstated and just ranges a bit above costs for new conventional buildings (e.g. few sources announced cost premiums between 2.0 % and 7.0 %).[82] Moreover a study by Kats, et al. showed that e.g. a 2.0 % increase of construction cost due to green building features result in a lifecycle saving of over ten times of the initial investment.[83]

As several institutions from other countries summarises as well, Pitts and Jackson conclude that the income approach respectively income capitalisation and DCF-approach seems to provide the most logical framework for valuing commercial properties. Therefore it might be the most adequate valuation method for valuing "green" respectively energy efficient buildings in comparison to other traditional property valuation methodologies.[84]

4.1.2.3 Current Status of Green Property Valuation Approaches in the USA

As it was mentioned in the last preceding paragraph due to literature research the income capitalisation approach or DCF may have the highest potential of all traditional property valuation approaches to be the most suitable method for green property valuation.

Early examination and recommendations on integrating building energy performance or green building features into valuation practice by Chao and Parker stated more directly that especially the net income calculations in most cases seems to be the best practical substitute for information on market preferences. Even if the NOI seems to be the accurate starting-point for integrating building energy performance or green building features into property valuation, appraisers have to be aware that the main problem arises when the estimation of energy costs rely to owners' disclosure of historical data-track.[85] To handle this lack Chao and Parker assumed that verification of energy efficiency by using performance assessment tools in contrast to green building rating tools such as LEED or Energy Star, or energy costs normalisation methods on the basis of specific building energy performance databases could probably isolate the effects of high-performance features. On the other hand such more or less sophisticated simulations require indeed comprehensive technical background, which valuers might not have, because they are not energy specialists.

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[82] Cf. Valhouli, C. (2006), p.2 et seqq.; cf. Commission for Environmental Cooperation (2008), p.55.
[83] Cf. Kats, G., et al. (2003), p.84 et seqq.
[84] Cf. Pitts, J., Jackson, T. (2008), p. 117.
[85] Cf. Chao, M., Parker, G. (2000), p. 14.

Alternative approaches to value green features such as the "Triple Bottom Line" (TBL)[86] or the "Full-Cost Accounting" (FCA), which were not established by property valuation professionals, are trying to measure green features on a more holistic basis by focusing in addition to economic and financial aspects as well on environmental, social and community factors.[87] Approaches like the TBL are rising in acceptance but still be not noted by the property appraisal society, which may result from the fact that usually such holistic aspects are not considered as relevant so far.

Barring all the mentioned aspects and possible starting points for linking sustainability or green building features to property valuation there are no precise property valuation methodologies available so far, which could be proven basis for more far reaching analyses. Therefore more detailed investigations on possible linkages has to be done to find the most adequate and simple solution which supports appraisers as well as property owners and investors to understand the impacts of green building features on property value.

Further the green building society needs to understand the property valuation methodologies used by appraisers and more important what constitutes "property's value". Ceteris paribus valuers have to expand their knowledge of green building benefits and costs.[88]

4.1.2.4 Empirical evidence for the impacts of sustainability issues on real estate market

Several latest empirical studies such as the investigations by Eichholtz, Kok and Quigley[89] or Miller, Spivey and Florance[90] stated that they have proven independent evidence of the impact of green building ratings on property rents and sales prices. For example Eichholtz, et al. concluded on the basis of statistical analyses (regressions models, hedonic pricing models, etc.) that in average LEED or Energy Star certified office properties achieved a 2.0 % higher rent in comparison to unrated non-green properties. Ceteris paribus, the increment to the selling price may be up to 16.0% and lead to higher value of a certified green building.[91]

Although these above mentioned studies conclude and show clear numerous impact, it can be noted critically that such figures which are based on historical data from a time whereas green

[86] Taking social and ecological performance adjacent to economic performance of an asset into account.
[87] Cf. Corps, C. (2005), p.23 et seqq.
[88] Cf. Corps, C. (2005), p.4
[89] Cf. Eichholtz, P., Kok, N., Quigley, J. (2008), p.16 et seqq.
[90] Cf. Miller, N., Spivey, J., Florance, A. (2008), p.15 et seqq.
[91] Cf. Eichholtz, P., Kok, N., Quigley, J. (2008), p. 20 et seqq.

building ratings such as Energy Star or LEED still have been in a pilot phase and where adjusted several times may not be adequate enough to get representative evidence. Also other reviews on the mentioned investigations e.g. by Muldavin [92] have conclude with a similar statement such as some of the findings might probably be regarded carefully as sample sizes might be too small/reduced database, statistical problems might appear or the submarket might vary.

In addition even though there are few approaches mentioned which measure the effects of green buildings So far there is like in other countries only anecdotal evidence that green building features will increase the value of a building.[93] Moreover it was critically announced by Valhouli already in 2006, that even if evidence of higher prices of green buildings would be available there is still the question of how much of the price premium is driven by green property features and/or what was influenced due to branding/marketing, design or location.[94]

All these mentioned thoughts arises the hypothesis if the already existing building performance and building design rating tools are adequate and suitable enough to draw evidence from value impact of green properties.

4.2 Experience within the European Union

4.2.1 Germany

Since 2003 the city of Darmstadt is using the first ecologic rent table for the estimation of local comparable residential rented floor area.[95] In Germany rent tables are established as the legal basis for landlords to raise net rents for residential floor area in comparison to the real rental market. The basis is given by real empirical data of the local rental markets, which were updated over the years with the aid of surveys. 2008 the city of Darmstadt published a revised rent table and adjusted the impact of energy efficient characteristics of buildings.[96]

In cooperation with the Institute of Living and Environment (Institut für Wohnen und Umwelt) in Darmstadt this ecological rent table was developed and established. The first result of the research project was the statistical proof that buildings, which feature a special characteristic,

[92] Cf. Muldavin (2008), p.10 et seqq.
[93] Cf. Pitts, J., Jackson, T. (2008), p. 116.
[94] Cf. Valhouli, C. (2006), p.4.
[95] Amt für Wohnungswesen Darmstadt (2003), p. 3.
[96] Amt für Wohnungswesen Darmstadt (2008), p. 3.

the good thermo technical quality ("gute wärmetechnische Beschaffenheit"), are able to get a premium on the basic rent compared to energy inefficient buildings of 0.37 €/m².[97] The aim of the cooperation was to investigate the impact of the thermo technical quality of residential buildings. The research was carried out within the preparation of the rent table for Darmstadt. The analyses result in a practicable and useful way of integrating the energetic characteristics into the qualified rent table with the aid of information of the EPC.[98]

If a building is able to fulfill the conditions to get the characteristic of "average/upgraded thermo technical quality" net rent compared to non energy efficient buildings goes up about 0.37 €/m² or even 0.49 €/m² for living space in Darmstadt due to the rent table published in 2008. The following explanations will give a short summary of the conditions that have to be achieved to get a premium due to the characteristic of thermo technical quality with the aid of EPC's.

4.2.1.1 The "Thermo Technical Quality"

To assess this special building characteristic the valuer need an energy performance certificate of the building being valued. Page two of the EPC (Energieeinsparverordnung 2007 respectively Energieeinsparverordnung 2002) is giving the required input. Basically the appraiser has to calculate the value of the primary energy demand ("Primärenergiekennwert") of a building to assess the thermo technical quality.

The valuer has to differ between the assessment of buildings using petroleum gas, fuel and electricity and buildings using district/local heating systems, timber, other renewable fuels, carbon or mixed use of energy sources. Figure 18 illustrates the ratio, which should be used for the assessment for buildings using petroleum gas, fuel and electricity. The appraiser only has to use the primary energy demand published within the EPC in comparison to the required energy demands.

[97] Knispel, J., Alles, R. (2003), p. 1.
[98] Amt für Wohnungswesen Darmstadt (2003) and (2008).

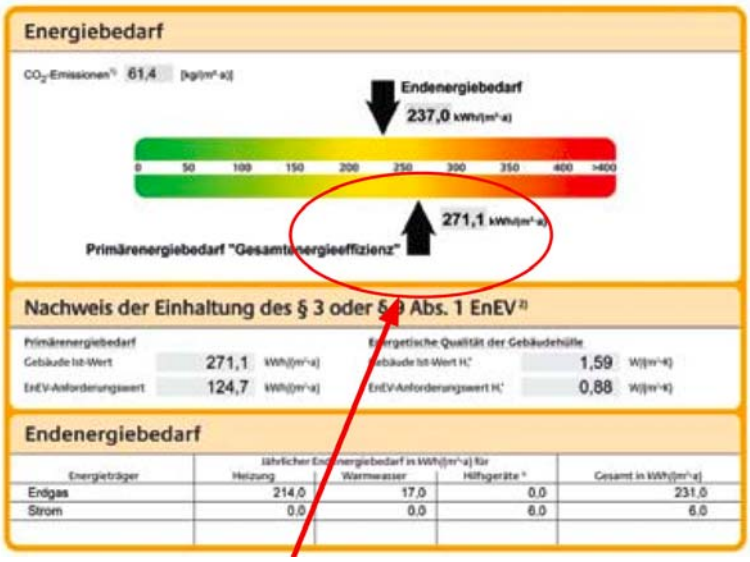

Figure 18: Display detail of a German EPC -
Page 2 highlighted the amount of primary energy demand, which should be used for the assessment of the energy efficient characteristic of the thermo technical quality for buildings using petroleum gas, fuel and electricity in Darmstadt.

Buildings that use district/local heating systems, timber, other renewable fuels, carbon or mixed use of energy sources have to be assessed with the aid of an adjusted primary energy demand. The weightings for the different energy sources can be seen in Figure 19.

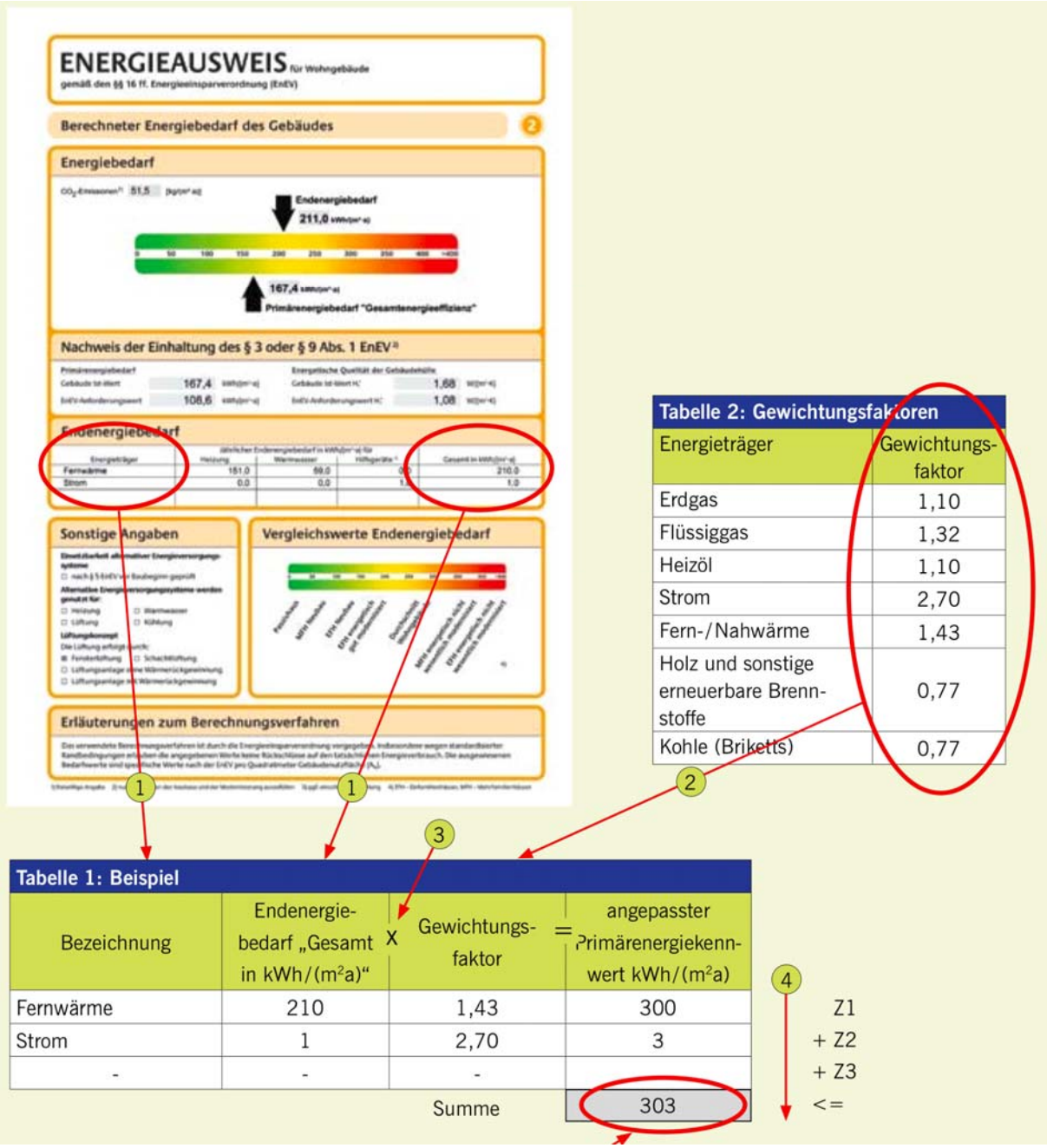

Figure 19: Display detail of a German EPC -
Page 2 highlighted the figures and weights, which should be used for the calculation of the adjusted primary energy demand for buildings using district/local heating systems, timber, other renewable fuels, carbon or mixed use of energy sources for heating in Darmstadt.

After assessing the primary energy demand the valuer is able to estimate the energy efficiency of the building in comparison to the required energy demands for average and upgraded

thermo technical quality published in the rent table. Table 1 gives a summary of the possible premiums.[99]

Primary Energy Demand (kWh/m²/a)	Building Characteristic	Premium €/m²
exceeds 250	non energy efficient	0.00
175 - 250	average thermo technical quality	0.37
less than 175	upgraded thermo technical quality	0.49

Table 1: Possible Premiums for energy efficient buildings in dependence on the primary energy demand.[100]

Concluding a numerical example using the parameters of section 3.5.4 and the income approach of year's purchase demonstrate the upcoming difference of non-energy efficient residential buildings to buildings which match the average or upgraded thermo technical quality in Darmstadt.

4.2.1.2 Example

The figures in the following example are inline with the examples given in Chapter 3.5.4 to . In this example the annual gross income of rounded 150 000 € (i.e. 8.33 €/m²/month) is the basic rent for non-energy efficient buildings. The published basic rents for the city are less than 8.33 €/m²/month.

[99] Amt für Wohnungswesen Darmstadt (2008), p. 11.
[100] Ibid.

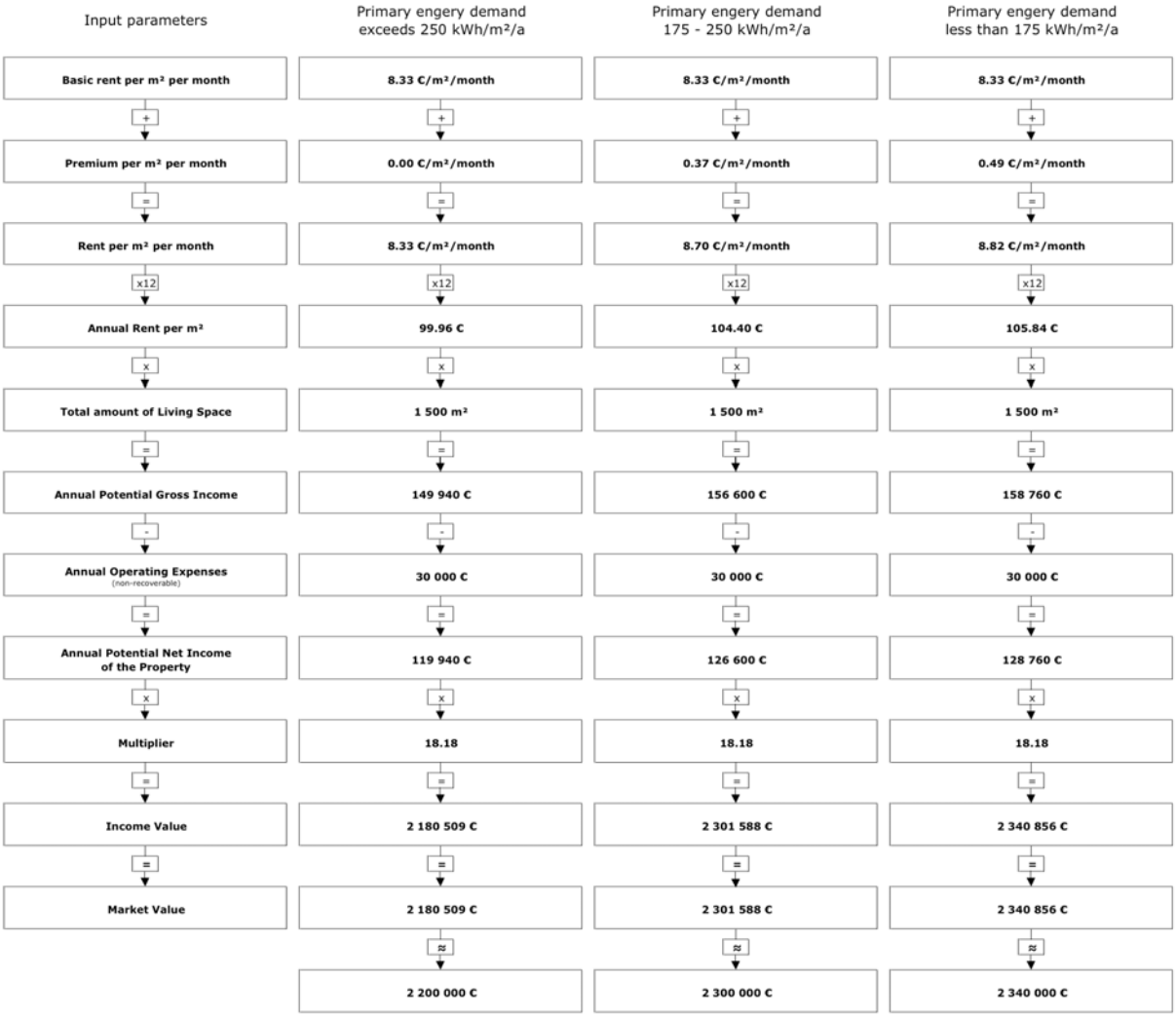

Figure 20: Numerical example - possible premiums Darmstadt 2008

The premium for market value and the changes of annual net and gross income for buildings with average respectively upgraded thermo technical quality is shown in Table 2. In this example a building with a primary energy demand less than 175 kWh/m² per year gains a premium in value of nearly 6.00% in comparison of a non-energy efficient building.

Modification of Parameter	Average thermo technical Quality	Upgraded thermo technical Quality
Annual Potential Gross Income	4.25%	5.56%
Annual Potential Net Income of the Property	5.26%	6.85%
Market Value	4.35%	5.98%

Table 2: Differences resulting out of the calculation shown in Figure 20

4.2.1.3 Conclusion

Since the introduction of the first qualified ecological rent table in Darmstadt in 2003 it had an announcement effect all over Germany. But nevertheless it is still the only qualified ecological rent table today. On the on hand e.g. the city of Frankfurt was trying to establish an ecological rent table but the broad public resistance avoided the implementation of energy efficient characteristics.[101] But on the other hand some other cities like Wiesbaden, Bochum and Magdeburg will analyze the energy efficient characteristics of residential buildings to include the aspect of energy efficiency into the qualified rent tables.

For the city of Darmstadt it is obvious, that the energy efficiency already had an impact on the value of properties. The question is, how much does it costs to bring a residential property to such a energy efficient level. Will it be more or less the 5.98% of it's total value, more or less 140 000 € as in the given example.

Otherwise it should be mentioned that basic rents for leasable residential area for the most properties are less than 8.33 €/m², i.e. the percentage premium would be bigger relatively to the basic rent than 6.00% for the most residential properties in Darmstadt despite the figures mentioned in Table 2.

4.2.2 United Kingdom

4.2.2.1 Recommendations on Green Property Valuation from the UK

In the UK studies and investigations on green property valuation and ambitious of quantifying the impact of sustainable "green" properties on the real estate market respectively rents and

[101] http://www.fr-online.de/frankfurt_und_hessen/nachrichten/frankfurt/1580903_Energie-egal.html

sales prices of properties are recently driven primarily by the RICS[102] and few research activities by Kingston University[103] as well as University of Reading.[104]

In contrast the sustainable building market in the UK has been pushed in the past, as it was observed in other countries such as USA or Australia, by several sustainable building rating tools such as the "Building Research Establishment Environmental Assessment Method" (BREEAM) and the already mentioned "Energy Star" rating system (see chapter 4.1.1.2). These has occurred, as Fisher, et al.[105] have mentioned as well, in a observable lack of information of property appraisers and might be one of the main problems why there is no common sense how the linkage between property appraisal and building energy performance measurements and assessment tools could be assembled. To advance this lack of information property valuation surveyors have to catch up in understanding the principles of sustainability and relationship to property worth and value.

4.2.2.2 State-of-the-art of Green Property Valuation in the UK

The research and investigations concerning green property valuation was rising strongly due to current awareness of environmental and climate changes the last five years. One of the recent developments, which push the awareness and, current state of science for green property valuation in the UK are driven by the RICS.

The most notable improvement in that context aside from valuable investigations of Sayce and Ellison[106] is the recently published guidance by the RICS, which addresses the integration of building sustainability into the commercial property valuation process. Instead of giving described terms of which and how numerous building performance aspects and indicators could be integrated, the guidance focuses more on the factors and reasons appraisers have to look at to cover all necessary green building items..[107] The paper points out that such green

[102] See www.rics.org for further information
[103] Cf. Sayce and Ellision (2008).
[104] Cf. Fuerst, F, Mc Allister, P. (2008).
[105] Cf. Fisher, R., Coll, L, Pelly, L., et al. (2008), p.19
[106] Sayce and Ellison (Kingston University) are one of the first who recognised the importance of the awareness and integration of green issues in the real estate profession and drove the investigations and research activities on that topic in the UK.
[107] Cf. RICS Valuation Standards Board (2008), p.9 et seqq.

factors should be taken into consideration in the property valuation practice, which will impact the following parameters[108]:

- Rental growth and rental security,
- Depreciation, obsolescence and potential loss of occupier demand,
- Future sales ability (exit yield, duration to sale and let)
- Life-cycle costs,
- Direct and indirect impacts of environmental hazards, and
- Demand for the building attributes (if property is not “sustainable”, “green”).

Such green features and indicators are in general (compare following) related first of all to building-oriented aspects such as building design and configuration, construction materials, secondly to site-oriented factors (e.g. land use, location, accessibility, fiscal considerations, etc.) and to property management and lease issues.

[108] cf. RICS Valuation Standards Board (2008), p.8

	Green Aspect	Green Features and Indicators
Building	Design & Construction	Quality & Life-Cycle, efficiency of floor area, efficiency of resources, flexibility, adaptability, human health, performance.
	Construction Material	Type of building material, replacement/ repair/reuse of material, building services, energy efficiency and sourcing, water efficiency, waste management.
	Management & Lease Issues	Green leases, green lease schedule (GLS), energy management plan (EMP), responsible property investment (RPI), social responsible investment (SRI).
Site	Land Use	Contamination aspects, lending policy, possible liabilities due to contamination.
	Location & Accessibility	Accessibility (transportation) could be factored in addition to location aspects, which are already considered within the traditional valuation process.
	Fiscal Considerations	Tax breaks or incentives, financial penalties due to environmental issues, insurance cost premiums.

Figure 21: RICS Green Building Key Issues and Aspects[109]

In comparison to other publications also Sayce and Ellison mentioned rental growth, depreciation, risk premium and cash flow as key variables where similar green issues and characteristics (see Figure 22) most likely can be linked to property valuation.[110]

[109] Cf. RICS Valuation Standards Board (2008), p.9-18.
[110] Cf. Sayce, S., Ellison, L., Smith, J. (2004), p. 3.

Sustainability Factor	Adabtable Valuation Parameter
Building Adabtability	Risk premium, cash flow, rental growth, depreciation.
Accessability	Rental growth, depreciation.
Building Quality	Rental growth, cash flow, depreciation.
Energy Efficiency	Rental growth, risk premium, cash flow, depreciation.
Pollutants	Rental growth, risk premium, cash flow, depreciation.
Contextual Fit	Rental growth.
Water and Waste	Rental growth, cash flow, depreciation.
Satisfaction of Occupier	Risk premium.
Impact of Occupier	Risk premium.

Figure 22: Sustainability Criteria Linkages[111]

All the above-mentioned characteristics should be reflected by the valuer within the usual valuation to which extend such aspects impact properties value. This will primarily lead to adjustments of market yields and/or of the estimated rental value.[112] The RICS therefore provide a short guidance what appraiser has to be aware when analysing rental comparables and investigations on yields.

In assessing the rental evidence, trends in occupational requirements such as e.g. “green lease” agreements, which defines and negotiate green aspects such as service charge provisions, repair and improvement clauses, energy performance reporting and sets specific targets for environmental performances, have to be taken into considerations.[113] Further characteristics that most likely connected to rental and moreover property value and might be of interest are items which impact operating costs as well as layout, flexibility and accessibility.[114]

[111] Cf. Sayce, S., Ellison, L., Smith, J. (2004), p. 4.
[112] Cf. RICS Valuation Standards Board (2008), p. 19.
[113] Cf. Hinnells, M., Bright, S., Langley, A., et al. (2008), p. 545 et seqq.
[114] Cf. RICS Valuation Standards Board (2008), p.20

For the investigations on comparable yields indicators, which impact following sustainable aspects, are likely to effect investor's considerations:

- Increasing resource costs and their impact on rental growth,
- Ability to reach tenant demand,
- Failure to meet environmental and social standards (shorter refurbishment and redevelopment cycles),
- Ability to provide external and/or internal benefits.

To measure potential impacts of sustainability characteristic it was mentioned further that sensitivity analysis or other risk assessment modeling are therefore adequate tools and should be adopted.

Even if the mentioned RICS guidance do not deal with valuation methodologies in particularly it anyways stated that for preparing assessment of investment value appraisers should use a DCF adopted specific assumptions in relation to rental growth, operating expenses risk, depreciation and obsolescence, vacancy rates, service charge, etc.[115]

What is required the most is that these factors are taken into consideration within property valuation, which will or will not proof the buildings' ongoing demand and the reflection of these aspects through the used valuation methodology.[116] But to be able to do so as Sayce and Ellison constitute clearly it is more important and necessary for appraisers' judgment about value of sustainable property to first have benchmarks and knowledge about which indicators can be assessed to secondly be able to draw relatively importance of each indicator.[117]

4.2.2.3 Empirical studies concerning real estate market impact of green properties

In accordance to recent empirical studies energy performance and efficiency certified buildings might offer benefits to occupiers relating to business productivity, image and occupancy costs. Based on these advantages, certified buildings can result in higher rents and lower holding costs for investors; furthermore, certified buildings may require a lower risk

[115] Cf. RICS Valuation Standards Board (2008), p.22.
[116] Ibid. p.25.
[117] Cf. Sayce, S., Ellison, L. (2003), p. 8.

premium.[118] Similar results where already shown by Sayce, Ellison and Smith due to pilot-testings of green property valuation where modest movements in yield, rental growth and depreciation could be observed.[119]

Another independent survey of 110 LEED and 433 Energy Star (compare Figure 23) certified buildings by Fuerst and McAllister showed that there are differences between certified and non-certified buildings (CoStar Study).[120] The results of a hedonic regression model show that certified buildings in the same metropolitan region have a rental premium - in general the higher the rating, the higher the rental premium.

Comparing the transaction prices of 292 Energy Star and 30 LEED-certified buildings, a price premium of 10% and 31% compared to non-certified buildings in the same metropolitan area could be observed. Within the uncontrolled sample, it could be observed that a certified green building obtains higher rents, have lower vacancy rates and will be sold for more than non-certified buildings (see Figure 23 and Figure 24 below).[121]

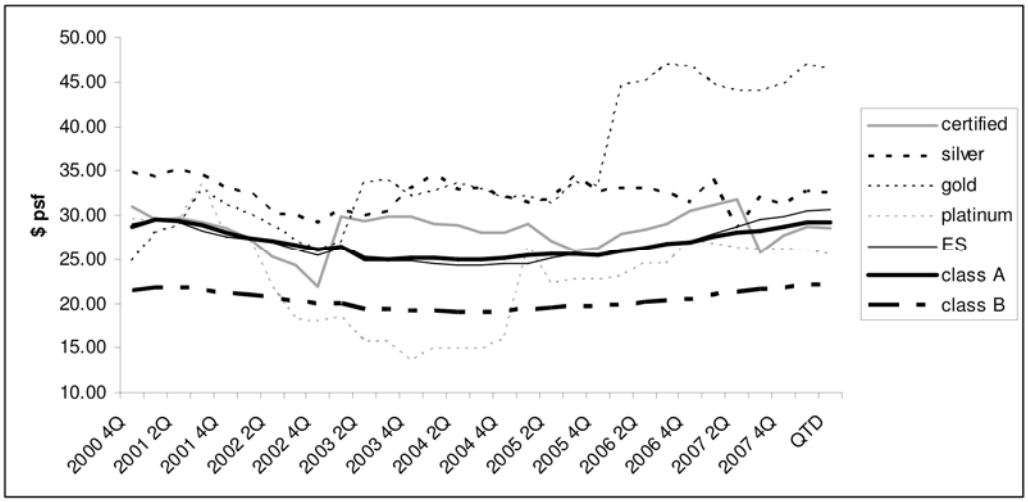

Figure 23: Average rent comparison of certified and non-certified Buildings

[118] Cf. Furest, F., McAllister, P. (2008), p. 2.
[119] Cf. Sayce, S., Ellison, L., Smith, J. (2004), p. 19 et seqq.
[120] Cf. Fuerst, F., McAllister, P. (2008), p. 2.
[121] Ibid. p.24

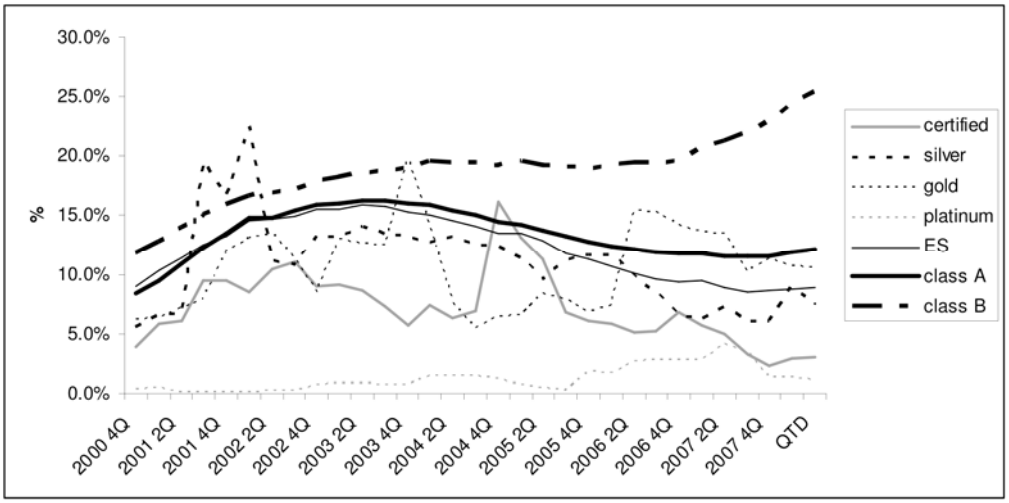

Figure 24: Average vacancy rate comparison of certified and non-certified Buildings

It has to be noted critically that even if the figures above show significant numerous differences between certified and non-certified properties concerning rents and vacancy rates the sample range needs to be much bigger (as Fuerst and McAllister stated themselves in their study[122]) to draw profound and criticism proofed evidence.

4.3 Conclusion

It can be stated so far that the international property community shares the same opinion, that sustainability in general and energy performance and efficiency of a building will influence the real estate market and furthermore will have an impact on property values (in contrast to the *"Null-Hypotheses"*[123]), but currently market evidence is not available due to limited data and experiences. Moreover it is clearly stated that there is still a big gap within the understanding and the lack of information concerning sustainability, green building rating tools between the key market drivers "property developers and investors" and those who reflect the market respectively "property appraisers" which prevent already in early stage the boost of innovations.[124]

[122] Cf. Fuerst, F., McAllister, P. (2008), p. 25.
[123] The *"Null-Hypotheses"* states that *"there is no relationship between the market value of a real estate asset and its green features and related performance"*.
[124] Cf. Waarren-Myers, G., Reed, R. (2009), p.9 et seqq.

It was stated e.g. in the Australian GBCA-survey that green building rating tools such as Green Star, LEED, etc. are driving the market for green buildings, but on the other hand as Ellison and Sayce noted are not an adequate basis and source of input indicators for property valuation.[125] Furthermore it was mentioned that property investors prefer building performance tools (e.g. National Australian Built Environment Rating System (NABERS) - former know as Australian Building Greenhouse Rating tool (ABGR) whereas property valuers tend to building design rating tools (such as Green Star, LEED, etc.).

Even though the mentioned countries such as Australia, USA and UK are far ahead and leading the investigation and research on how to integrate building sustainability into property valuation practice. But there are still quite a lot of misconceptions concerning the impact of green building design and features on asset value, as it was stated in the preceding Chapter. This should be relativised by time if as RICS[126] stated, valuation professionals becoming more aware of the relevance and start extensive and profound investigations on possible linkages between building energy performance and property valuation.

Although there are already few empirical analyses regarding the impact of energy efficiency and green buildings available, the results of such studies have to be reflected very critically and the mentioned numerous correlations between “greening” and the properties value in such studies have to be handled very carefully and should not be seen as proven facts. The main reason is that available data for quantifying such impacts are still very limited and that there is an observable inconclusiveness of the historical information, which was used for these analyses. Moreover as Muldavin[127] stated correctly further the main reason is the fact that the sample size for carrying out the analyses was to less randomly and the selected comparables often were not representative to show realistic evidence.

Further Lorenz, Trueck and Luetzkendorf[128] as well resumed that profound numerous adjustments of yields, rental growth regarding the building performance, energy efficiency and other green features in the property valuation practice are currently impossible, because of the lack of comparable, reliable data. They conclude as well that the progress over time in transferring building-related performance information (e.g. energy performance certificates)

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[125] Cf. Ellison, L., Sayce, S. (2006), p.289
[126] Cf. Corps, C. (2005), p.11
[127] Cf. Muldavin, S (2008), p.4 et seq.
[128] Cf. Lorenz, D., Trück, S., Lützkendorf, T. (2007), p.132 et seqq.

will create more tangible and sophisticated property transaction databases regarding green factures in the future as if e.g. the legislation for generating information of building's performance will be introduced - such as the European Union introduced the *"European Energy Performance of Buildings Directive"* (EPBD).

To abandon from all the different mentioned approaches for integrating sustainability respectively building energy performance into property valuation in more or less sophisticated way it has to be mentioned clearly, as Sayce and Ellison[129] resume as well, that if these linkages fed not into standard property appraisal tools without deep environmental or engineering specific know-how, the established approach will not be adopted in practice.

Furthermore without the development of adequate and useful basic tools for assessing investment worth and monitor performance of green building features, the real estate sector will continue to struggle with a common approach of linking sustainability issues to property valuation practice.[130]

[129] Cf. Sayce, S., Ellison, L. (2003), p. 8.
[130130] Cf. Ellison, L., Sayce, S. (2006), p. 302.

5 Starting Points: Integration of Energy Certification and LCC Issues

In the previous chapters of this report several valuation methodologies have been presented. Furthermore possible ways to include energy efficiency aspects have to be demonstrated and discussed. Therefore theoretical aspects were already drawn to show possible ways of including sustainable property aspects respectively energy performance and LCC indicators into the property valuation methods. The illustrated and explained methods offer several possibilities for including such energetic aspects in the existing methodologies.

The following chapters will analyse such possible linkages and therefore focus on different valuation methods for several types of real estate.

5.1 Sales Comparison Approach

The sales comparison approach compares buildings, which are similar e.g. in use, construction, location and shape. Taking into account the low availability of EPC's within the same property type - meaning the missing data - this approach might be difficult to follow and apply at recent stage. In the future, if market evidence for the value impact of green property features can be measured and quantified precisely, this approach might be easier in use in the appraisal process of properties.

The following Figure 25 shows the flow chart of the traditional comparison approach and points out linkage possibilities to EPC and LCC aspects and possible effects.

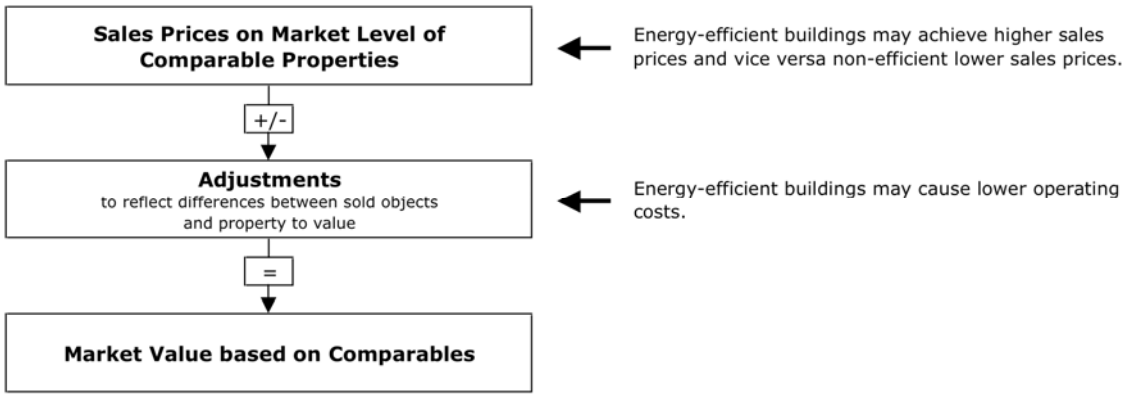

Figure 25: Possible Linkages within the Comparison Approach

5.1.1 Comparisons by using Buildings of the same Energy Efficiency Level

The idea of this way of integrating energy certification in property appraisal (see Figure 25) is to use only buildings, which are generally comparable to the valuation object (location, technical equipment, condition) including the energy efficiency level. As it was mentioned due to the lack of direct comparison possibilities in practice several adjustments regarding the energetic performance (energy efficiency, etc.) have to be taken in account to ensure comparables.

5.1.2 Adjustments derived from the Energy Efficiency Levels

If, as it is common in practice, there are no buildings, which are comparable to the appraised one, it is necessary to calculate adjustments. The suggested approach concerning the consideration of the energy certification is to calculate the monetary differences, which are caused by the different energy efficiency levels. To give an example: A building in class “C” may cause 10 € of heating costs per m² and year while a building in class “A” causes 3 € per m² and year. On basis of these calculations the adjustments may be carried out. But it should be mentioned that the previously addressed scenario is based on a technical effect: High quality components lead to low heating costs.

Additionally there is another effect, based on market change caused by the expected increasing demand for energy efficient buildings. This effect can currently not be calculated because of the lack of empirical data. To quantify this market effect a comprehensive data set will be necessary because the appreciations or depreciations need to be derived from regression models in a comprehensive way. The reason for multiple regression models in this respect is that the appreciations/depreciations do not only depend on the energy efficiency level, but also on:

- The type of the building; e.g. residence building, single-family house, office building.
- The location; e.g. there will probably be a difference if the building is located in a rough climate or in a temperate climate.
- The actual market situation, because the importance of energy will probably decrease if there is a drop in demand and vice versa.

These differentiations generally concern all assumptions in the several valuation methodologies, which are connected to the expected market change.

In addition also adjustments of the value influencing characteristics such as e.g. the layout of the property, the quality of the ground or encumbrances and rights have to be considered in the valuation procedure.

5.2 Cost Approach

If the cost approach is used, as valuation methodology the main effect will be based on adjusted construction costs, higher construction costs based on energy efficiency criteria can easily be reflected as adjustments to the indicators shown in Figure 26.

The higher costs of an energy efficient construction can therefore easily be taken into account by a higher value of the building facilities.

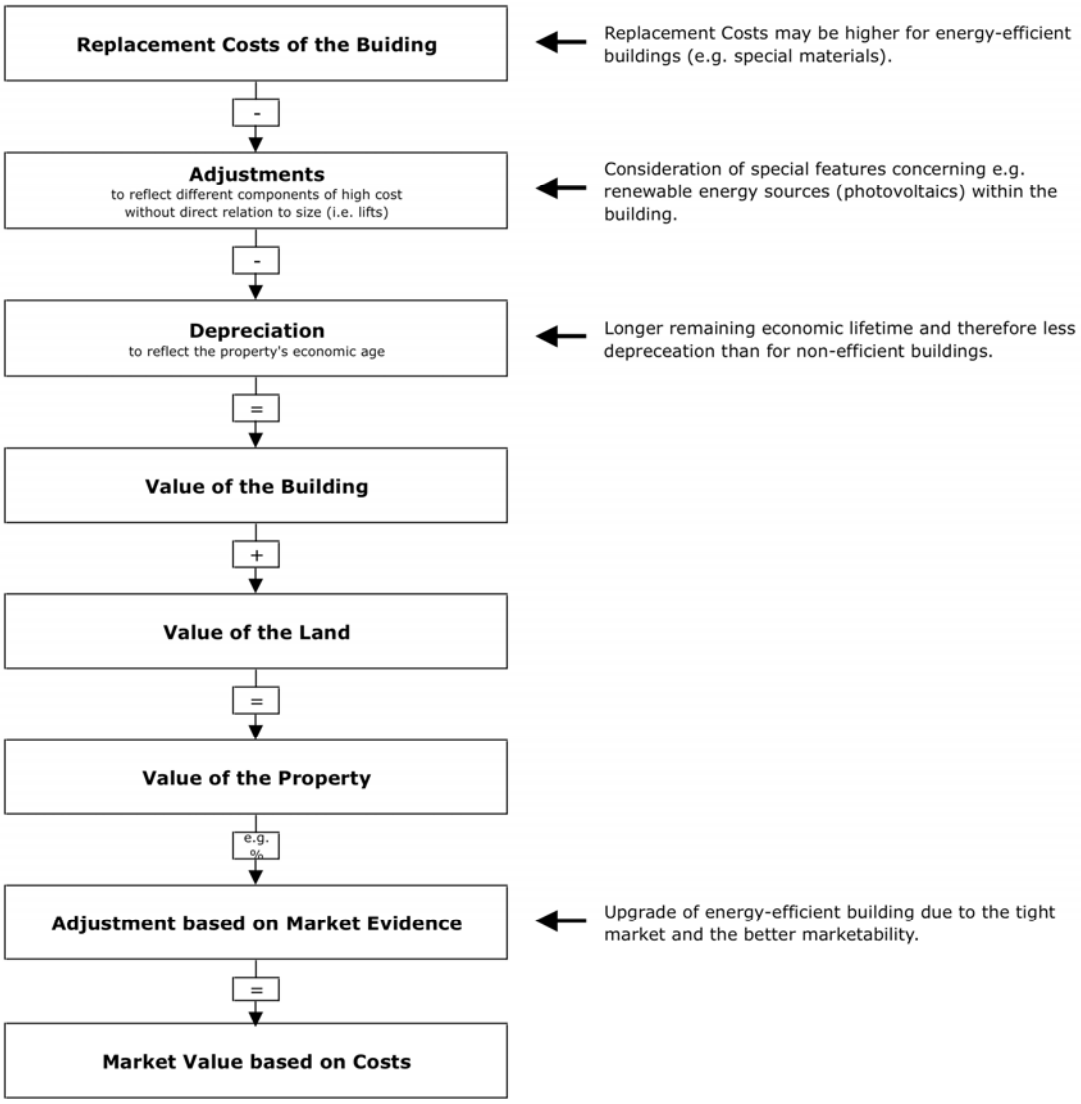

Figure 26: Possible Linkages within the Cost Approach

5.2.1 Adjustment of Construction Costs

The appraisal of construction costs (total replacement costs) is based on empirical values, derived from standardised tables with cost ranges. Valuers use standardised tables containing benchmarks, which depend on different building-qualities. It is agreed that buildings of a high thermal quality and consequently a “good” energy certification may cause higher construction costs and therefore lead to higher value. But the consideration of high-quality components is already common practice in building valuation. In this regard the introduction of the energy certification may not cause any changes. So here the same applies as for the remaining lifetime, namely not to mix up cause and effect: High construction costs caused by

components of a high thermal quality leads to a good energy efficiency level but not the other way round.

5.2.2 Depreciation of the Age of the Building

The depreciation due to the age of the construction depends, like the remaining lifetime (applied in income related approaches), on the technical condition of the building. Of course, thermal renovation improves the repair of a building, yet not every renovation necessarily improves the thermal quality. Furthermore, the same applies here as for the previous point: Cause and effect must not be mixed up because a good condition respectively a high quality of the thermal components has a positive effect on the fictive age of the building and consequently on the efficiency level of the building but not contrariwise.

5.2.3 Adjustments for Value affecting Characteristics

Basically the physical building-value is derived from the technical qualities of a building. Nevertheless, also factors, which reflect several economical qualities, have to be considered - of course, redundancies should be avoided. Examples for discount, respectively surcharges are for instance ‘specific location qualities’, ‘inefficient floor plans’ and the ‘energy efficiency’ of buildings’.

Moreover other property specific market situations have to be taken into account as well. An example therefore would be to consider the higher marketability of a house with energy efficiency class A++ due to the increasing demand expected.

5.3 Income Approach

The income approach is based on future cash flows. Due to the fact that income approaches are based on rental cash flows, these offer a possibility to include EPC due to higher gross income or lower operating expenses. Furthermore the yield/capitalisation rate offers a possible way to include energy efficiency by adding the criteria of attractive buildings with higher potential income, satisfied customers and therefore longer rent duration/shorter vacancies resulting in lower risk. Finally, market adjustments can be undertaken at the end of the valuation process. This attribute might be of increasing importance if the number of green and energy efficient buildings increases and a higher data basis is available. The following

two figures demonstrate possible ways of including energy efficiency into the valuation methods of direct capitalization and DCF.

5.3.1 Direct Capitalization

Regarding the direct capitalization approach, which presents one of the most applied income related method. To visualise and give an impression of possible linkages the following Figure 27 points out the valuation parameters which could be adopted for including energy performance- and life-cycle costing-related aspects within the application of the direct capitalisation approach.

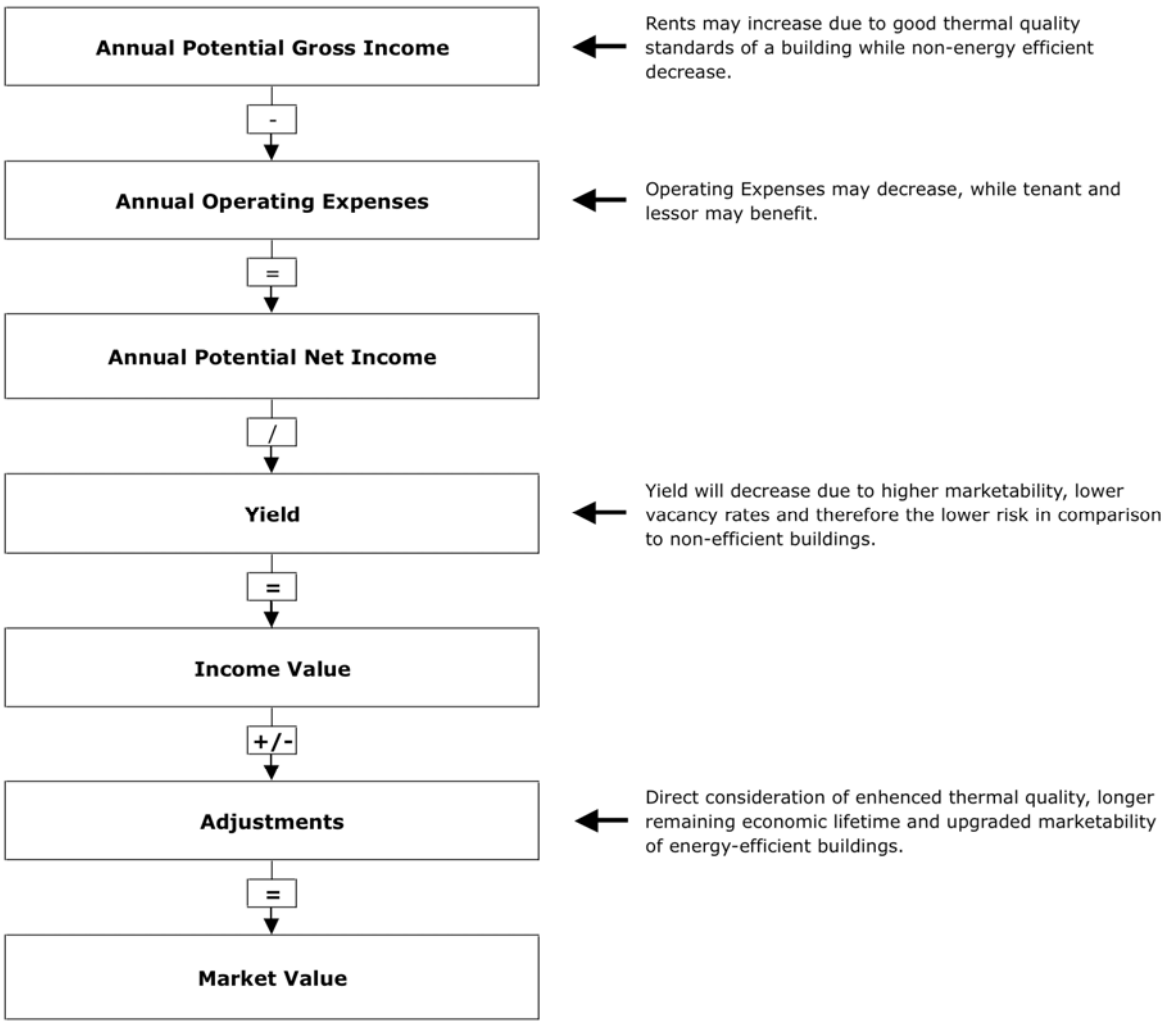

Figure 27: Possible Linkages within the Direct Capitalization Approach

5.3.1.1 Adjustment of the potential Gross/Net Income

Income related approaches discount forecasted services that flow from the property to the date of the appraisal. The appraiser uses information of the property under valuation (e.g. current rent, current operating costs, vacancy rate) and relevant information of the real estate market to rate the expected net operating rents for the upcoming periods. The motivation for integrating the energy certification at this point of the valuation process is that the energy efficiency level of a building will influence its marketability. This hypothesis is based on the assumption that the marketability of buildings of a high thermal building quality (probably) will increase in the future (while that of buildings of a poor will decrease) - this leads to lower (higher) vacancy rates. Moreover, a higher demand for buildings of a good energy efficiency level leads to a higher tenants' willingness to pay, while rents for buildings of a poor thermal quality tends to decrease.

5.3.1.2 Adjustment of the Yield

The derivation of the yield is one of the most important parts when applying the standardised direct capitalisation method as well as for other approaches like e.g. the discounted cash flow method. The idea of integrating the energy certification at this point of the appraisal process is as follows: the new transparency concerning energy efficiency will change the demand of the market to some extent. Buildings of a good thermal quality will have a lower risk concerning marketability while buildings of a poor thermal quality will probably suffer from lower rents and higher vacancy rates resulting from lower demand. This risk can be factored in a higher yield.

5.3.1.3 Adjustment of Maintenance Costs

The effects analysed in the previous sections refer to changes of the demand at the real estate market. The introduced approaches are based on the assumption that the availability of EPC's will raise consumers' awareness regarding energy efficiency of buildings and consequently may shift consumers' demands. On the other hand there are effects in context of energy certification, which do not result out of the market but from technical qualities of properties. Maintenance costs are an example for a technical influence and refer to the expenses of keeping a property in a good state of repair. The idea of the adjustment of the maintenance costs in context of energy certification is that e.g. buildings in a good efficiency level are in

top-condition and therefore cause lower maintenance costs. Or, the other way around, cause higher costs because of sophisticated technical equipment like heat pumps or solar heating systems.

5.3.1.4 Adjustment of the remaining economic Lifetime of the Building

Basically the remaining economic lifetime can be extended by carrying out several refurbishments or reduced due to insufficient maintenance. The energy certification, however, does not have a direct influence on the technical remaining lifetime of a building. But it is also necessary to mention that there is also an influence form the market. To give an example: Assuming that buildings of a certain poor thermal quality will be not marketable in the future this would result in a reduction of the remaining economic lifetime caused by the demand-side of the market. Therefore, the experts discourage to reflect this scenario in the appraisal speculatively.

5.3.1.5 Appreciation/Depreciation for Value influencing Characteristics

Another possibility of taking the energy efficiency level of a building into account is to adjust appreciations/ depreciations for value influencing characteristics. This means to consider direct surcharges or discounts for qualities of a property, which had not been considered in the pervious valuation process, i.e. the valuer have to avoid double considerations.

5.3.2 Discounted Cash Flow Approach

The widely used DCF approach offers several possibilities of including energy efficiency aspects, as demonstrated in Figure 28.

The cash flows can easily mirror the effects of energy efficiency aspects. Net rents and outgoings can be adapted to the current market situation, while better marketability and strong demand will result in higher net rents during the investment period.

Due to the higher acceptance of energy efficient buildings and the willingness to work in energy efficient buildings, investors may use a more favourable discount rate as well as higher growth rates.

The expected sales price at the end of the observed holding period might be higher due to lower depreciations, longer remaining economic lifetime, lower risk and therefore decreased

exit yield/cap rate and offer a imaginable possibility to include energy efficiency aspects into the DCF approach.

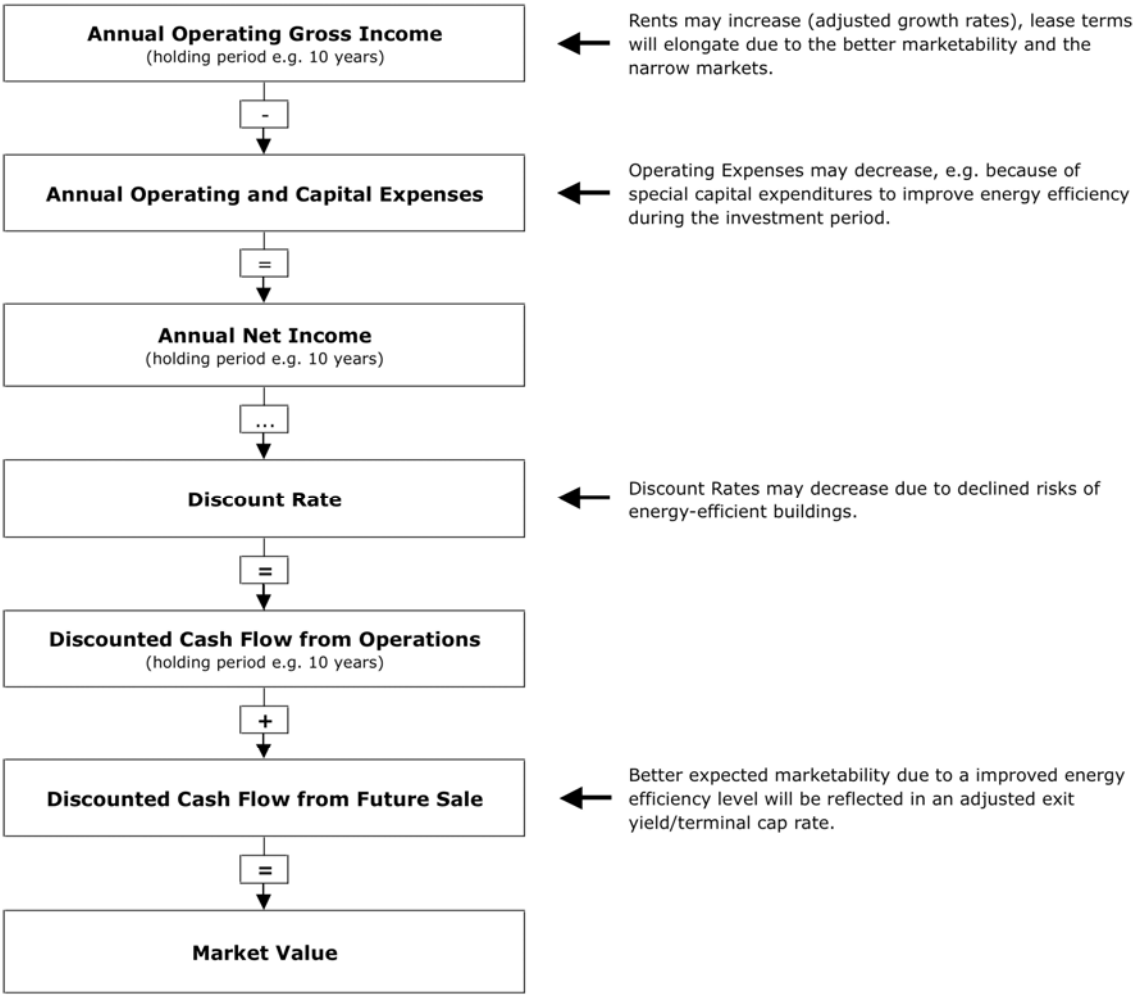

Figure 28: Possible Linkages within the DCF Approach

5.4 Résumé

There are several methods and approaches for including energy efficiency into the valuation methodologies depending on the analysed object and the method that was chosen. Thereby, especially the income approaches offer several possibilities for adequate inclusion of property sustainability issues.

The following Figure 29 illustrates possible attributes for integration of EPC aspects and LCC related topics.

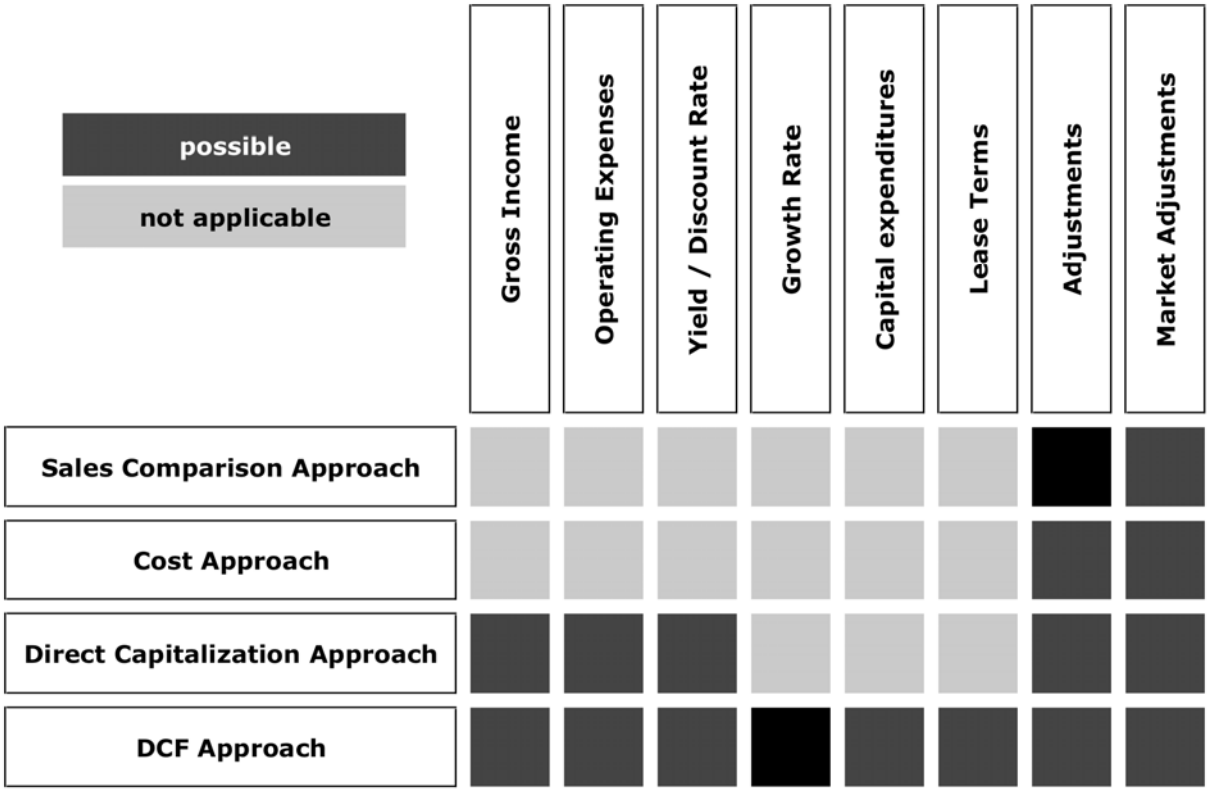

Figure 29: Possible Ways of including EPC's in different Valuation Methods

There are several possible ways of including energy efficiency and LCC aspects. Due to several different methodologies a classification of the methodologies in two classes e.g. valuation methods for residential property (cost approach) and for commercial property (income approach) seems meaningful. The main focus of this report was laid on the different valuation methodologies and approaches, whereas several aspects and possibilities for the integration of energy efficiency were proposed. Possibilities for quantifying these aspects will be discussed in WP5.

6 Conclusion and Outlook

In the presented report several different international and national approaches for the valuation of property and real estate were presented. Within all the different national regimes, a similar understanding of “Market Value” could be observed as the most likely value, which will be obtained in an open market between a willing buyer and a willing seller.

Furthermore all the valuation methodologies are based on three similar approaches: the income approaches, the cost approach and the sales comparison approach. The income approaches focus on cash flows, which will be obtained in the future; therefore it is normally used for income related objects like offices, shopping centres or retail. The cost approach is based on the initial construction costs, focusing therefore on the building materials - especially used for the valuation of residential property in few countries. The comparison approach uses prices of different other, but similar objects, and compares these prices with the building being valued. The methodology depends on the quality of the available data.

Furthermore, the integration of EPC into the valuation methodologies were analysed. Therefore various developments of different countries, which are leading the research on sustainability topics within the property valuation so far, such as Australia, USA, Germany and UK, were presented. Within the countries, some studies showed already positive correlations between the value of the building and energy efficiency, whereas the data basis is still very limited and might not representative enough so far.

The presented WP2 offers an important starting point for the inclusion of energy efficient aspects. Combined with WP3 and WP4, deeper insights of energy aspects and the opinion of market participants will be analysed in WP5.

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IV. Appendix

Annex I: LEED® (Leadership in Energy and Environmental Design)[131]

LEED is a standardized rating system, which was developed and established by the US Green Building Council to promote ecological and integral Property projects and developments, and as well sensitize and guide the real estate market to sustainability issues. It is an independent and voluntary national Standard which aims to establish more healthy and resource-saving building activity. Recently the most common property types for which LEED certifications are carried out are office buildings, schools and universities. The LEED rating scheme uses the allocation of credit points for specified sustainability criterias of properties and distinguish between the following four different categories due to the achieved amount of points:

- LEED® **Certified** (23 to 27 points),
- LEED® **Silver** (28 to 32 points),
- LEED® **Gold** (34 to 44 points), and
- LEED® **Platinum** (45 to 61 points).

Over the time LEED has diversified its certification offers according to new property constructions or already existing buildings as well as different property types (see Figure 30).

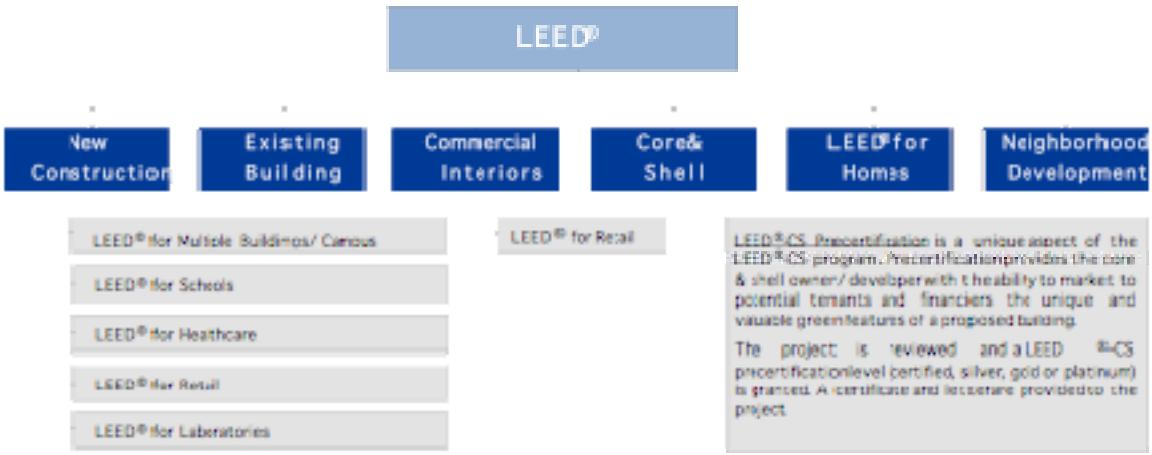

Figure 30: LEED Certifications

[131] www.usgbc.org

Annex II: NABERS (National Australian Built Environment Rating System)[132]

NABERS is a performance-based rating system for existing buildings, which was established by the NSW Department of Environment and Climate Change. NABERS rates a building such as commercial office, hotel or residential building on the basis of its measured operational impacts on the environment, and provides a simple indication of how well property management is managing these environmental impacts compared with peers and neighbors.

NABERS now incorporates the Australian Building Greenhouse Rating (ABGR), which has been re-named NABERS Energy for offices.

NABERS offers different rating tools which allocate "stars" for various specified sustainability criteria's of properties according to following property types:

- Office (NABERS Office)
- Residential (NABERS Home)
- Hospitality sector (NABERS Hotel)
- Retail (NABERS Retail)

The NABERS ratings tool uses according to the mentioned different rating tools above several star classifications. The general structure herein is always based on five stars, which express the following:

- 5 stars (best building performance – the building is leading the market)
- 4 stars (strong performance – building demonstrate excellent energy and water performance)
- 3 stars (above average building performance – building is performing better than the current market average)
- 2 stars (below average building performance – building is below current market average performance)

[132] www.nabers.com.au

- 1 star (poor management or system – building is consuming a lot of unnecessary energy and water, there are several opportunities to reduce consumption)

Annex III: BREEAM (Building Research Establishment Environmental Assessment Method)[133]

BREEAM is a voluntary scheme that aims to quantify and reduce the environmental burdens of buildings by rewarding those designs that take positive steps to minimize their environmental impacts.

Projects are assessed using a system of credits in which those designs that take positive action to minimize their environmental impact are recognized. The credits are grouped within the following issues:

- Management
- Health and Well Being
- Energy
- Transport
- Water
- Materials
- Land use & Ecology
- Waste
- Pollution

The assessment process results in a report with a formal certification giving a rating on a scale of PASS, GOOD, VERY GOOD, EXCELLENT and OUTSTANDING.

[133] www.breeam.org

Legal disclaimer