

Summary of the Thesis to achieve  
the Degree of Master of Business Administration (MBA)

## **Impact of Sustainability on Property Values**

Author: Dipl.-Wirtsch.-Ing. (FH) Berit Schumann  
Address: Alfred-Brehm-Platz 12, 60316 Frankfurt am Main, Germany  
Submitted to: University of Regensburg  
Wirtschaftswissenschaftliche Fakultät  
IRE|BS International Real Estate Business School

Date of Issue: March 12, 2010

---

Table of Contents

<b>1</b>	<b>PROBLEM AND OBJECTIVE</b> .....	<b>3</b>
<b>2</b>	<b>FUNDAMENTALS</b> .....	<b>4</b>
2.1	Definition of Sustainability and Sustainable Development .....	4
2.2	Government Regulations and Certification Systems .....	7
2.2.1	<i>Government Regulations</i> .....	7
2.2.2	<i>Voluntary Rating Systems</i> .....	8
<b>3</b>	<b>EMPIRICAL STUDIES</b> .....	<b>9</b>
3.1	Study Findings on Construction Costs of Sustainable Properties.....	9
3.2	Study Findings on the Benefits of Sustainable Properties .....	10
3.3	Conclusion .....	13
<b>4</b>	<b>SURVEY AMONG GERMAN INVESTORS</b> .....	<b>14</b>
4.1	Background of Survey .....	14
4.2	Results of Questionnaire .....	15
4.3	Conclusion .....	20
<b>5</b>	<b>SUSTAINABILITY IN PROPERTY VALUATIONS</b> .....	<b>21</b>
5.1	Sustainability Factors and Theoretical Linkage to Value .....	22
5.2	Reflecting Sustainability Issues in Property Valuation Methods.....	25
5.2.1	<i>Sales Comparison Method</i> .....	25
5.2.2	<i>Income Method</i> .....	26
5.3	Obstacles in Assessing the Value of Sustainability .....	27
5.4	Recommendations .....	29
5.4.1	<i>Consideration of Sustainability Certification in Property Valuation</i> .	29
5.4.2	<i>Economic Sustainability Indicator</i> .....	29
5.4.3	<i>Improved Documentation in Transaction Databases</i> .....	31
5.4.4	<i>Reporting Requirements</i> .....	33
5.5	Conclusion .....	33
<b>6</b>	<b>SUMMARY OF RESULTS AND OUTLOOK</b> .....	<b>34</b>

---

## 1 Problem and Objective

Climate change has an increasingly high profile globally and is perceived to be directly related to greenhouse gases and CO<sub>2</sub>-emissions. It has been acknowledged that buildings are substantial greenhouse gas emitters; about 40 % of the overall greenhouse gas emissions in Germany are produced by real estate. Assets consume about 30 % of all resources through their construction, operation and demolition and 30 % of overall energy consumption is attributed to real estate.<sup>1</sup> Research from the Inter-Governmental Panel on Climate Change (IPCC) has confirmed that buildings represent the best opportunity to make significant reductions in greenhouse gas emissions while maintaining economic growth; the IPCC estimates that by 2020 CO<sub>2</sub>-emissions from building energy use can be reduced by 29 % at no extra cost.<sup>2</sup> Over the last twenty years the concept of sustainable development has therefore assumed an increasingly central role worldwide. Particularly since the abrupt end of the most recent real-estate boom, the discussion of sustainability has come to the fore, with the debate in Germany, as elsewhere, having become significantly more dynamic.

Sustainable buildings are generally seen as those which are environmentally friendly, save energy and reduce running costs. Users should benefit from positive working environments. The importance and benefits of sustainable buildings are beyond doubt, at least from social and ecological perspectives. Investment decisions are however made almost exclusively in accordance with financial considerations, as investors are mainly driven by monetary actions. Investment in sustainable commercial buildings has to be justified on an economic basis.

The objective of this thesis is to investigate what influence sustainability has as a value factor for German commercial properties and whether a sustainable commercial building in Germany is worth more than a conventional one. The author used two approaches to assess whether sustainable buildings have an impact on property Market Value. The thesis first reviews existing published studies conducted internationally, focusing on the measurement of the direct economic costs and benefits associated with sustainable commercial buildings. The author additionally carried out a questionnaire-based survey among investors who are active in the German real estate market to provide some indication of whether sustainable properties in Germany are likely to command higher asset values. A further aim of this survey was to understand the key issues driving sustainability and to investigate some of the perceptions that may be shaping sustainable real-estate demand.

The more the subject of sustainability asserts itself in the real-state industry's collective consciousness, the more urgent becomes the consideration of sustainability criteria in real estate valuation. Valuers are thus facing the new challenge of embracing the practical implications of sustainability. The goal of this thesis is, in addition to the objective above, to analyse how, and to what degree, sustainability aspects can be considered in valuation of commercial real estate, determine which valuation techniques are best suited to valuing sustainable buildings, what is required in order to do this and what barriers and challenges do valuers face when assessing the value of sustainability with regard to commercial buildings.

---

<sup>1</sup> see Reinartz, Beate (2009), page 3.

<sup>2</sup> see IPCC (2007), page 389.

---

## 2 Fundamentals

To adequately consider the impact of sustainability issues on property values it is initially essential to define sustainability.

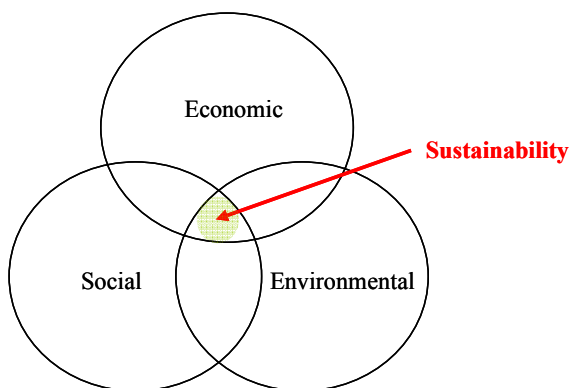
### 2.1 Definition of Sustainability and Sustainable Development

The terms *sustainability* and *sustainability development* are widely used but are often confusing, mainly due to the fact that more than 100 definitions of sustainable development exist.<sup>3</sup> *Sustainability* is to ensure that all businesses, public services, natural resources, the economy and communities have the capacity to continue in the future. According to the RICS<sup>4</sup> research report *sustainability* is “an end state in which all human activities can be maintained within the existing capacity of the planet”<sup>5</sup>. *Sustainable development* is however “the process of moving towards the goal”<sup>6</sup>. The most commonly accepted definition of *sustainable development* is from the 1987 UN Brundtland Commission Report according to which such a development “meets the needs of the present without comprising the ability of future generations to meet their own needs.”<sup>7</sup>

*Sustainable development* considers the so called *Triple Bottom Line* concept of environmental, economic and social issues.<sup>8</sup> There are two commonly accepted models of *sustainability development* based on the *Triple Bottom Line* methodology as first developed by Elkington, John (1994) and also mentioned by O’Riordan et al. (2001) and Lützkendorf, T. and Lorenz, D. (2005).

In the Three Pillars model, sustainability is seen as the merging of economic enterprise and growth, as social well-being and as minimising environmental impact. Terence Boyd adds that sustainability “will balance economic and social performance measures with environmental protection”<sup>9</sup>.

Figure 1: Three Pillars Model of Sustainable Development



Own Illustration, after O’Riordan et al. (2001); RICS (2007 a), page 10

---

<sup>3</sup> see RICS (2007 c), page 10.

<sup>4</sup> RICS - Royal Institution of Chartered Surveyors

<sup>5</sup> RICS (2007 c), page 10.

<sup>6</sup> RICS (2007 c), page 10.

<sup>7</sup> Brundtland Commission (1987), Chapter 2, Towards Sustainable Development.

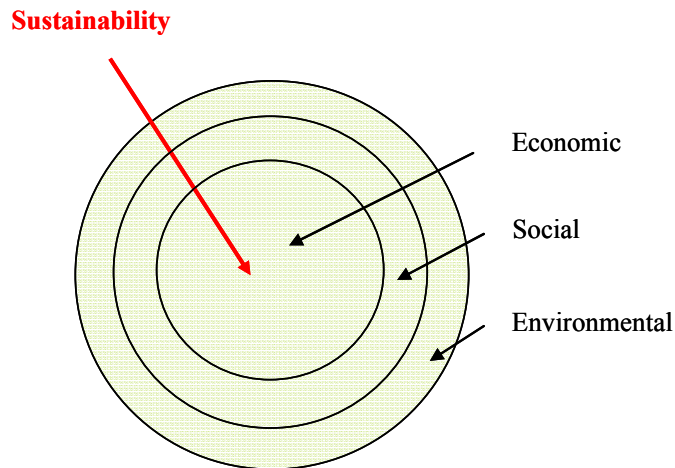
<sup>8</sup> see Reed, Richard (2009 a), page 16 ; RICS (2007), page 6.

<sup>9</sup> see Boyd, Terence (2005), page 2.

---

The ‘Russian Doll’ model, an alternative concept, puts economic factors at the centre as the basis of wealth creation, driving the development engine, but at the same time is constrained by environmental and social considerations.<sup>10</sup>

Figure 2: Russian Doll Model of Sustainable Development



Own illustration, after O’Riordan et al. (2001); RICS (2007 a), page 10

According to Lorenz, David (2007) the three pillars of *sustainable development* in accordance with the *Triple Bottom Line* Concept are characterized as follows:<sup>11</sup>

- *Ecological sustainability* is dependent on material, energy, noise emission, amount of waste products, amount of traffic, old building material separation and disposal, land use/pollution, climate change and biodiversity and means reduction of area used, conserving resources and avoidance of deleterious materials and emissions.
- *Social sustainability* is based on the social aspects such as feeling of wellbeing, aesthetics, health & comfort, security and user satisfaction, appropriate living environment and social integration.
- *Economic sustainability* is the minimising of life-cycle costs<sup>12</sup> and value retention (material, goods and capital). Functional-aesthetic aspects such as the maximising of functionality, adaptability, serviceability and design should also be considered.

Financial sustainability is ultimately dependent on fulfilment of the economic, social and ecological sustainability criteria. Increasingly the three dimensions stated above are underpinned by a fourth dimension, which comprises the institutional and governance structures needed to make sustainability work.

---

<sup>10</sup> see O’Riordan et al. (2001); RICS (2007), page 6.

<sup>11</sup> see Lorenz, David (2007), page 1 ; Lorenz, David (2008 d), page 2.

<sup>12</sup> Life-cycle costs in this case mean construction costs, operating costs and the cost of deconstruction and disposal.

The Enquete Commission of the German parliament has also defined the expression *sustainability* and also concluded that it is “[...] die Konzeption einer dauerhaft zukunftsfähigen Entwicklung der ökonomischen, ökologischen und sozialen Dimension menschlicher Existenz. Diese drei Säulen der Nachhaltigkeit stehen miteinander in Wechselwirkung [...]”<sup>13</sup>

The terms *green building* and *sustainable building* are often used synonymously and interchangeably, but these expressions have to be separated as they have different meanings. *Green buildings* are expected to deliver lower energy consumption and consequently lower CO<sub>2</sub> emissions. According to Lützendorf and Lorenz (2007/2008) the definition of *sustainable building* “goes far beyond the narrower concept of lowering a building’s energy consumption”<sup>14</sup> as *sustainable buildings* are constructed with a higher urban planning, creative, functional and technical quality. This is similar to the three aspects detailed above although the terminology used in this thesis attempts to keep these expressions separate but where other studies are referred to the original terminology is retained. The following table illustrates the difference between sustainable and green buildings.

Table 1: Differentiation of Sustainable and Green Building

<b>Ecological</b>	Use of Ressources	} <b>Green Building</b>	} <b>Sustainable Building</b>
	Emissions Waste Accumutation		
<b>Socio-cultural</b>	Well-being, Comfort User Satisfaction Functionality		
	<b>Economic</b>	Life-cycle Costs Value Growth Flexible Use	
		<b>Technical</b>	
<b>Process</b>	Planning Building Construction Maintenance		
<b>Location</b>	Micro Location Utilities Infrastructure Provision		

Own Illustration, after Horster, Herman (2009), page 13

<sup>13</sup> Enquete-Kommission (1998) “[...] the conception of a persistent, future-compliant development in terms of economic, ecological and social dimensions of human existence. These three pillars of sustainability interact with one another [...]” This is a non-authorized translation into the English language.

<sup>14</sup> Lützendorf and Lorenz (2007/2008), page 60.

---

Sustainability has to be considered over a building's entire life-cycle ranging from location and design (greenfield/estate management, planning and procurement), through the construction process, usage and operation of the building to ultimate disposal and recyclability. In addition to the nature of the property itself, ecological, long-term economic, functional-aesthetic and socio-cultural organisational aspects of a sustainable building also includes the appropriate manufacturing and construction processes. The table attached to this thesis in appendix I considers the impact of sustainability on the 5 phases of the property's lifecycle in relation to the three pillars of sustainability.

From the investor's point of view a sustainable building is one which provides an adequate long-term yield, as the onus in investment is on wealth creation and, in turn, the monetary value. Those properties are therefore sustainable which can adapt well to changes in the ecological, social and economic environment, thus minimising the risk of decreasing value.

## 2.2 Government Regulations and Certification Systems

In the real estate sector, a blend of mandatory government regulation and voluntary industry standards has emerged in response to pressure to reduce the environmental impact of the building stock. As a result, required building standards have tended to become more stringent. In addition to mandatory certifications, the growth of environmentalism has led to the emergence of market-based approaches in the form of a range of voluntary, environmental certification systems for buildings. In recent years, various assessment systems for sustainable buildings have been developed worldwide with the aim of standardising and promoting the adoption of sustainable building technology and which measure and assess the sustainability of real estate. BREEAM<sup>15</sup> is the oldest certification system for sustainable buildings and is considered the model and basis for the US standard LEED<sup>16</sup> and for the Australian system Green Star, in each of which country-specific adjustments were undertaken. LEED and BREEAM are the only international accepted standards among the approximately 30 country specific assessment systems worldwide. Germany has developed its own label – The DGNB – Deutsches Gütesiegel für Nachhaltiges Bauen.

Mandatory government regulations and the voluntary rating systems are described in more detail in the following sections.

### 2.2.1 Government Regulations

With the aim of implementing the European Union's guidelines for the prevention of climate change at national level the German government laid down the framework of an integrated energy and climate programme (IEKP)<sup>17</sup> in August 2007, which tightened the energy efficiency requirements for buildings and includes requirements from 2009 concerning the use of renewable energy as part of the measures to achieve the climate protection targets set for 2020 (raising the proportion of renewable energy used and energy efficiency, in both cases by 20 %). Parliament's Merseberger resolution subsequently ratified the first and second climate protection

---

<sup>15</sup> BREEAM - Building Research Establishment Environmental Assessment Method

<sup>16</sup> LEED - Leadership in Energy and Environmental Design

<sup>17</sup> Also known as "Merseberger Beschlüsse".

---

packages (Erneuerbare-Energien-Wärmegesetz (EEWärmG) and the amended energy saving regulation (EnEV 2009)).

EEWärmG obliges owners of buildings constructed from 01 January 2009, to source some of the energy supply for heating from renewables (e.g. geothermal, latent heat pumps, solar energy or biomass).

The energy saving regulations (EnEV) in Germany is the implementation of the European parliament's 2002/91/EG guidelines and the directive of 16 December 2002 on the overall energy efficiency of buildings. The EU Energy Performance of Building Directive requires Energy Performance Certificates (EPC), which serve as a scale against which buildings' energy efficiency can be compared. EnEV ensures that buildings undergoing refurbishment meet certain minimum energy requirements. According to EnEV 2009 all residential and commercial buildings of over 1,000 sq.m. must have an EPC from 1 January 2009 and 1 July 2009 respectively, when they are bought, sold or let.<sup>18</sup> From 2012 energy efficiency requirements for new buildings are to be raised by a further 30 % (EnEV 2012). Should it transpire that the climate protection targets cannot be achieved by these measures alone it is to be expected that the regulations applying to existing buildings will be tightened.<sup>19</sup> This will oblige landlords to invest and provide economic pressure to act.

### 2.2.2 Voluntary Rating Systems

Voluntary rating systems so far used across Germany to measure and assess the sustainability of real estate are the German Building Certificate DGNB (Deutsches Gütesiegel für Nachhaltiges Bauen), which was founded in 2007, the BREEAM Rating System, established in the UK in 1990 and the LEED Rating System, first released by the US Green Building Council (USGBC) in 1998. Compared to the UK or the US real estate markets, the number of certified sustainable properties in relation to the overall commercial building stock is very low. These three sustainability certification systems are currently competing for acceptance by investors. The systems are of limited comparability in terms of their informative value as they partly vary in terms of the range of criteria, definition of performance indicators and their respective weighting and the presentation of results.<sup>20</sup> DEGI Research states that foreign labels are criticised as their evaluations do not consider the complete building's life cycle. They further opine that "state or building guidelines and the state of technology, as well as geographical and climatic conditions vary between countries, so that a LEED certification can be achieved relatively easy in Germany"<sup>21</sup>. On the other hand LEED and BREEAM are internationally accepted certificates and are therefore used by international active real estate participants.

---

<sup>18</sup> 75% of these buildings do not yet have an EPC, according to a questionnaire survey by Deutschen Energie-Agentur (dena) among federal, state and city representatives. The obligation to display it affects some 55,000 public buildings such as town halls, schools and hospitals according to dena. see Immobilienwirtschaft (2009), page 44.

<sup>19</sup> see Ernst & Young (2008), page 15.

<sup>20</sup> see appendix II of this document.

<sup>21</sup> DEGI Research (2008), page 4. If a builder in Germany complies with the statutory standards for construction materials, power and energy, the building will be of LEED silver certification standard. This emphasises the generally high statutory construction standards in Germany.

---

As the different systems are difficult to compare directly, it is important in future to develop a unitary certification standard for the whole of the EU which can be transparently adjusted for particular national, geographic and climatic conditions, as a multiplicity of certification systems for sustainable buildings makes transactions more difficult for international real estate companies.

### **3 Empirical Studies**

The impact of sustainability measures on the return from investment property is important for investors as they need to know whether the application of advancements in environmental and/or social factors will result in improved returns from the property.

To empirically analyse the economic performance of sustainable properties it is necessary to look at a large quantity of properties. They also have to be in use and operating for a certain period of time in order to assess their benefits compared to conventional buildings e.g. long-term savings in operating expenses. Only a few properties in Germany have been certified thus far under any of the certification systems<sup>22</sup> and the majority of these properties are new developments which are still under construction or have just been completed. It is therefore impossible so far to perform an empirical study of the performance of sustainable buildings in Germany.

The vast majority of latest case studies and comparative analyses in this field have been published in the United States of America and Australia as a large quantity of assets have already been certified in these countries and there is an excellent degree of data transparency which enables such analyses to be carried out.<sup>23</sup> Additionally case studies based on interviews with developers, owners and occupiers of sustainable buildings have been completed across Canada, the United Kingdom (UK) and the US. This chapter summarises the main findings of these studies in respect of the additional construction costs and economic performance benefits of sustainable buildings, in order to assess whether these are likely to be applicable in Germany.

#### **3.1 Study Findings on Construction Costs of Sustainable Properties**

The Morrison Hershfield report which has analysed sustainable developments in Canada points out that most of those empirical studies identified a cost premium associated with LEED-rated new buildings and that higher rated buildings tend to have a higher cost premium.<sup>24</sup> The report further states that the level of cost premium is relatively low with a range of between 2 % and 10 % depending on the rating level. A 2007 Davis Langdon study as well as those of RICS and Kats et al. showed that there is no significant difference in average costs for sustainable as compared to non-sustainable assets.<sup>25</sup> A Cushman & Wakefield (2008) report points out that several other studies have quantified this and demonstrate that sustainable building initiatives increase

---

<sup>22</sup> see appendix III of this thesis.

<sup>23</sup>In the United States of America the CoStar Group maintains an extensive database of approximately 332,000 U.S. commercial buildings, their locations, and hedonic characteristics, as well as the current tenancy and rental terms for the buildings. see <http://www.costar.com>.

<sup>24</sup> see Mark Lucuik, P.Eng. (2005), pages 48-49.

<sup>25</sup> The RICS report looked at 17 sustainable buildings in Canada, UK and US. The Kats report analysed costs and benefits of 33 sustainable building in California. see Kats et al. (2003), page 10 ; RICS (2005), page 28; Langdon, Davis (2007), page 3.

---

the cost of development by less than 5 % with very short payback periods.<sup>26</sup> The report further states that these up-front payments comprise a minor part of the building's operation lifecycle costs. Greg Kats et al. also conclude that the present value of the reduced operating costs alone is sufficient to cover the construction cost premium.<sup>27</sup> Turner however found cost premiums up to 20 %.<sup>28</sup> The level of construction costs is dependent on the timing of the decision to obtain certification as well as the level of certification desired and is likely to be much lower where the requirements of certification have already been integrated into the planning of a new project than retrofitting an existing property. Higher investment costs result when a building is first designed as a basic standard building and improved with additional measures subsequently.

These research shows that there is still uncertainty over the cost increment, which could potentially amount to the entire development profit, wipe out equity and deter risk-averse lenders who are sensitive to the potential for cost overruns in new constructions. Such costs therefore have to be consistently accompanied by an understanding of the benefits obtained through the additional construction cost. If the additional construction costs were to be offset by the increase in value, the additional spending would be justified. The US Department of Energy (USDOE) reports it is usually possible to lower lifecycle costs significantly, recovering these even in the case of high-value sustainable features within three-to-five years.<sup>29</sup> Jon Robinson also states that "whilst having an initial capital investment surcharge, this investment [will repay] many time over in terms of lower energy and operational costs"<sup>30</sup>. In order to be compensated for the additional construction costs of sustainable buildings, rational investors will require a combination of higher income and/or reduced risk. Failure to observe price premiums in sustainable buildings would provide an economic disincentive to real estate investors to invest in sustainable buildings, given the additional costs of certification.

### 3.2 Study Findings on the Benefits of Sustainable Properties

According to studies carried out by RICS and Kats et al. the ownership of sustainable buildings results in multiple benefits to investors due to the various characteristics of such properties, ranging from lower operating costs to improved marketability, longer useful life spans, increased occupant productivity and well-being, as well as more stable cash-flows which in turn have economically quantifiable benefits.<sup>31</sup> According to Eichholtz, Kok and Quigley there are at least four types of economic benefit as a result of investing in sustainable buildings: saving resources on energy, reducing water and waste disposal and reductions in other operating costs, saving against future energy price increases and reducing greenhouse gas emissions.<sup>32</sup>

Links are beginning to emerge between the Market Value of a building, its sustainable features and its performance. This picture is presented by research in the US and Australia based on case studies which identify the economic value of the certification of sustainable buildings and show that tenants and investors have factored-in the advantages of sustainable buildings.

---

<sup>26</sup> see Cushman & Wakefield (2008), page 7. The Cushman & Wakefield report does not provide more detail on these studies (author etc.).

<sup>27</sup> see Kats et al. (2003), page 7.

<sup>28</sup> see Turner Construction (2004).

<sup>29</sup> see USDOE (2003), page 8.

<sup>30</sup> Robinson, Jon (2005), page 3.

<sup>31</sup> see Kats et al. (2003) ; RICS (2005).

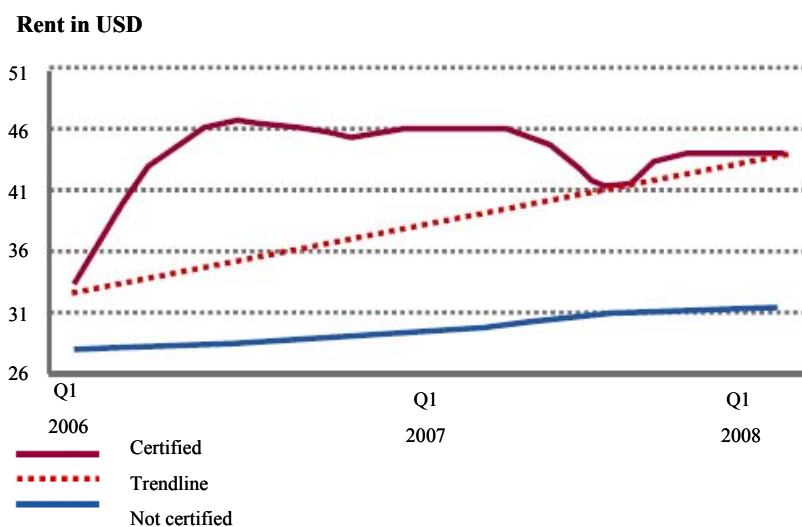
<sup>32</sup> see Eichholtz et al. (2009), page 8.

The Kats study concludes that over a period of 20 years savings of around 20 % of the building's costs may be saved due to sustainable characteristics. The sustainable fit-out characteristics, in contrast, were found to raise the original project costs by around.

The Green Building Council of Australia reported in 2006 that sustainable buildings in Australia commanded 5 % to 10 % higher rents and had higher relative investment returns (minimum 14 % ROI) and asset values (10 %).<sup>33</sup>

A newly published paper by Franz Fürst and Patrick Mc Allister from the University of Reading, Henley Business School investigates the rent and price effects of environmental and sustainable certification on US commercial real estate assets by using a hedonic regression analysis.<sup>34</sup> The results show that rents for buildings with one Energy Star or a LEED Certificate are 11.8 % higher than for non-certified buildings in the same metropolitan area and “that the more highly-rated buildings are in terms of their environmental impact, the greater the rental premium”<sup>35</sup>. Price premiums of 10 % to 31 % were achievable compared to the sample of non-certified assets in the same metropolitan region depending on the certification. The following chart demonstrates graphically the rental development of sustainable compared to conventional commercial buildings in the US.

Figure 3: Rental Development of Sustainable and Non-sustainable Commercial Buildings in the US



Own Illustration, after Bürklin, Bernhard (2009), page 7

A US survey of 355 LEED and 973 Energy Star accredited buildings carried out by the CoStar Group and the University of San Diego reported rental premiums of USD 11.33 per square foot, an increase in occupancy rates by 3.8 % and sales premiums.<sup>36</sup> Sustainable buildings in the US showed significant savings in water and natural gas and 36 % lower energy consumption. Productivity gains by employees in sustainable buildings, due to increased well-being and lower staff churn rates, have also been reported and are estimated at between 1 % and 25 %. CoStar

<sup>33</sup> see Green Building Council of Australia (2006), page 5.

<sup>34</sup> see Franz, Fürst and McAllister, Patrick (2008), A rental analysis was carried out for 543 certified and compared to 3,626 non-certified benchmark buildings. This data was taken from the CoStar database of US commercial real estate.

<sup>35</sup> Franz, Fürst and McAllister, Patrick (2008), page 2.

<sup>36</sup> see CoStar Group (2008), page 49.

concluded 8 % higher rent level and 20 % higher sales prices for Energy Star certified buildings and over 30 % higher rent and a 60 % higher sales price for LEED certified assets.

More recently, in 2009, Eichholtz, Kok and Quigley provide evidence that rental payments for US sustainable office buildings are about 3 % higher than rents for comparable buildings nearby.<sup>37</sup> The economic analyses reach the conclusion that effective rents for sustainable properties which have i.e. been adjusted for occupancy level are above 6 % higher than for non-certified nearby properties. The study further points out that the transaction prices for sustainable US office buildings are about 16 % above the sales prices of comparable non-sustainable office properties.<sup>38</sup>

The CoStar study and those of Eichholtz, Kok, and Quigley and Franz and McAllister are all based on the CoStar data. Any differences can mainly be traced back to the variations in defining the comparisons for the certified buildings. The above mentioned data (higher rent, lower vacancy and lower running costs) already imply in the absence of any possible multiplier premium a significantly higher sales price.

The empirical study “Green Value, green building, growing assets” prepared by RICS in 2005 also states that “Green buildings can provide financial benefit”<sup>39</sup>. This is based on interviews with developers, owners and occupiers of sustainable buildings across Canada, the United Kingdom and the United States and finds that sustainable buildings exhibit higher asset value, as sustainable buildings command higher rents and prices, cost less to operate and maintain and, in most cases, can secure tenants more quickly and enjoy lower tenant turnover as well as improving business productivity for occupants, affecting churn, renewals, inducements and fitting-out costs among others. This is also supported by the CoreNet Global Sustainability Survey according to which about two thirds of the EMEA respondents were willing to pay up to 10 % more in rent for a sustainable building.<sup>40</sup>

Research on the economic benefit of German sustainable assets is very limited so far. Construction costs for sustainable German developments have only been published for a very small number of properties which are summarised in the following table:

Table 2: Savings and Costs of Selected Sustainable German Developments

Development	Year of Construction	Additional Construction Costs	Savings
Lindsey Carree, Hamburg	n/a	5-8% of construction costs	25 % of operating expenses
Pasing-Arcaden, Munich	2010/2011 (Pipeline)	ca. 2 % of construction costs	60,000 EUR of savings (equal to 0.25 EUR/m <sup>2</sup> p.m.)
Karolinenkarree, Munich	2006-2008	ca. 3 % of construction costs	n/a

Own Illustration, for data see Ernst & Young (2008), page 31; Reinarzt, Beate (2009), page 9

<sup>37</sup> see Eichholtz et al. (2009), page 9, Rents of 694 certified sustainable buildings were assembled and compared with 7,489 non-certified assets situated within a quarter mile radius. Furthermore transaction prices of 199 green office properties sold between 2004 and 2007 and 1,617 non-green proximally located buildings were analysed.

<sup>38</sup> see Eichholtz et al. (2009), page 9.

<sup>39</sup> RICS (2005), page 2, The author understands that the term ‘green’ has been used synonymously for the expression ‘sustainable’.

<sup>40</sup> see CoreNet Global and Jones Lang LaSalle (2008), page 5.

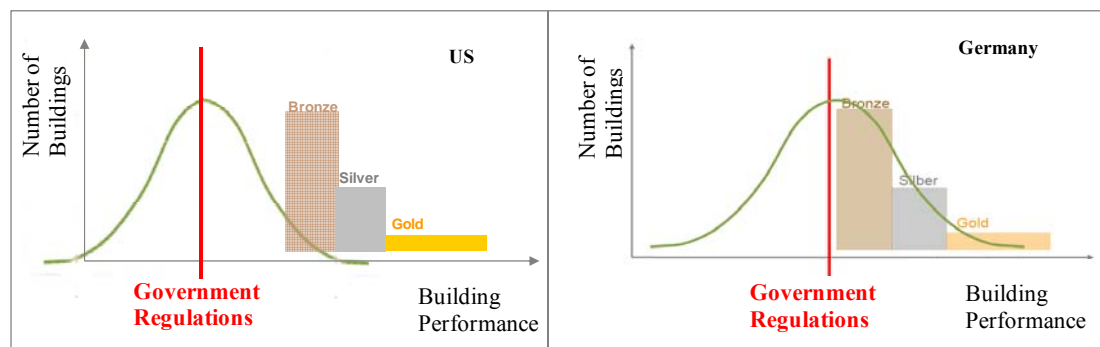
### 3.3 Conclusion

The results of these studies indicate that there are financial benefits accruing to sustainable properties compared to non-certified assets resulting in higher achievable rents and sales prices and that real estate investors will be rewarded for the additional costs of providing certified buildings.

The author of this thesis is however of the opinion that there is some inaccuracy in respect of the results of these studies. In order to be able to explore the financial benefit of sustainability in properties it is necessary to compare 100 % similar properties in a similar real estate market and a similar market cycle. The nature of real estate is that every parcel of land is unique and heterogeneous, which makes it complicated to compare buildings in the marketplace, as properties differ in terms of location, building age, material, design, quality and lease term among other factors, so that no property is 100 % identical to any other thus hindering the comparability of price impacts.<sup>41</sup> Furthermore, the level of sustainability in each building can vary substantially e.g. ranging from minor to major sustainable initiatives which may result in differing property values. There can also be differences in sales prices of sustainable and non-sustainable properties simply because they were sold in different market cycles or due to short-run imbalances in supply relative to demand. The purchase price of a property may also be dominated by the weighting placed by market participants on a number of other issues e.g. property's location and appearance.<sup>42</sup>

The degree to which the proven, quantifiable effects found for the US are transferable to Germany is questionable. The regulatory construction standards in Germany are higher, whereby the differences between sustainable and normal construction methods is, in the author's subjective judgement, likely to be less pronounced as illustrated in the following chart.

Figure 4: Certification Standard in Comparison with Government Regulations US/Germany



Own Illustration, after Bode, Ralf F. (2009), page 24; Bürklin, Bernhard (2009), page 8

<sup>41</sup> The empirical study conducted by Eichholtz et al. (2009) explains that the sample of sustainable buildings are substantially larger, show higher occupancy rates and are newer compared to their nearby non-sustainable buildings. see Eichholtz et al. (2009), page 18; The empirical study conducted by Franz Fürst and Patrick Mc Allister (2008) points out that the hedonic model measures controls for differences in age, height, quality and metropolitan area, but the model does not control for differences in micro-location. see Franz, Fürst and McAllister, Patrick (2008), page 4.

<sup>42</sup> see Franz, Fürst and McAllister, Patrick (2008), page 7.

---

It may be expected that, analogously to the smaller additional expense for planning and construction, the quantifiable benefits will also be smaller e.g. economic benefits resulting from increased employee productivity will be smaller due to the existing high-standard requirements of German workplace regulations.

These empirical studies are indicative of the general effects; however an individual cost-benefit analysis is needed in Germany to establish the degree of economic and financial advantages of sustainability, similar to the studies conducted in US and Australia. This can however only be carried out in of the coming years to quantify long-term savings. Further research is required in the following areas:

- Ascertain the additional economic and financial benefit from the various levels of sustainability standards which have been introduced, e.g. what is the additional financial benefit of a DGNB Gold or LEED Gold certificate compared to a DGNB Bronze or LEED Silver certificate?
- Ascertain the additional construction costs for bringing an existing building up to a particular sustainable standard.<sup>43</sup> So far empirical studies have focused on analysing the additional construction costs for new developments.
- Ascertain the level of sustainability in Germany's extant building stock. How many uncertified properties in Germany are already of a standard which is certifiable and simply lack the certificate itself as German buildings have a higher building standard compared to properties in e.g. the US?
- Ascertain whether market participants buildings to be sustainable simply because they have a sustainability "label" in the form of a certificate from LEED, BREEAM or DGNB? Is there any economic benefit of certified sustainable buildings compared to non-certified sustainable buildings?
- Lifecycle cost analysis is needed to establish the link between sustainable building and property value because much of a sustainable building's asset value may lie in its long-term lifecycle benefit and to demonstrate the advantages for the tenant. How much do tenants save in overall occupancy cost? This is helpful for the property owner to achieve higher net rents in lease negotiations.<sup>44</sup>

## **4 Survey among German Investors**

### **4.1 Background of Survey**

As already explained in section 0 of this thesis it is not yet possible to carry out an empirical study to assess the impact of sustainability on property values in Germany due to the scarcity of certified properties.<sup>45</sup> In addition, the results of the studies addressed in section 0 may not be

---

<sup>43</sup> According to DEGI Research (2008) only 0.5 % of the building stock in Germany is new developments. see DEGI Research (2008), page 4.

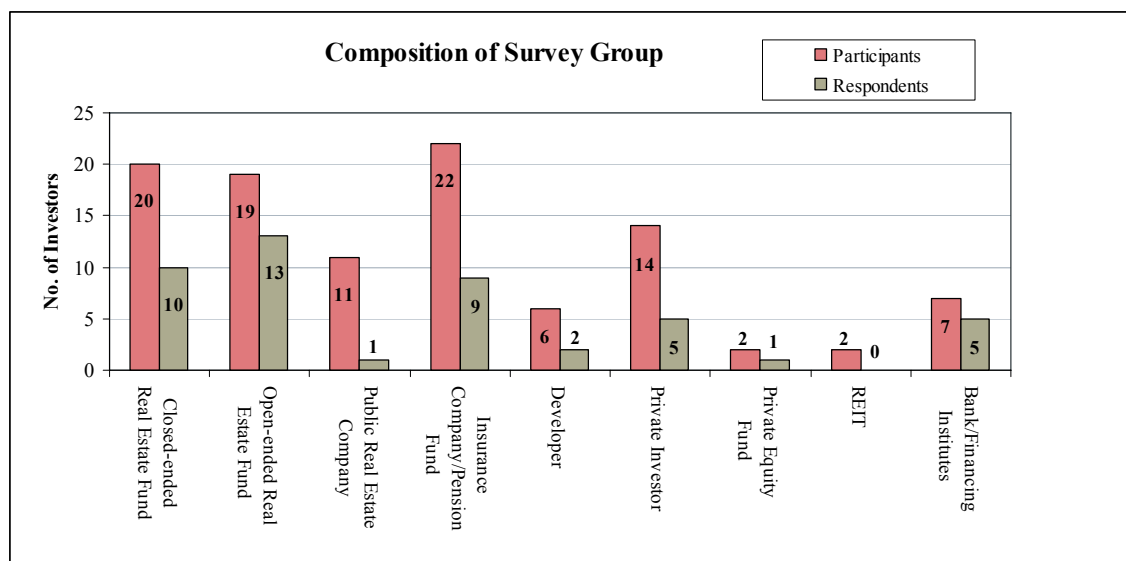
<sup>44</sup> In Germany the majority of the space is let on the basis of a net lease, where the tenant pays the majority of the outgoings.

<sup>45</sup> As detailed in section 2.2.2 and 0, due to the small number of certified properties there is not enough substantial market data on sustainable buildings to make reliable comparisons with non-sustainable buildings.

directly applied to the German real-estate market. To provide some indication of whether sustainable properties are likely to command a premium in rents and asset value, a questionnaire-based survey was carried out by the author of this thesis among investors active in the German market. This chapter therefore focuses on analysing what the price effect might be, rather than what the price effect actually has been. In addition to analysing whether a sustainable building is worth more than an uncertified building of comparable standard, a further aim of the survey was to understand the key issues driving sustainability in real estate and to investigate some of the perceptions that may be shaping sustainable real-estate demand.

The author has chosen all investors active in the German market as population to conduct this survey as this is the group which has the most influence on pricing alongside tenants who were not addressed in the survey due to the amount of effort which would be involved in compiling a representative population. To determine the population the Expo Real register was consulted as there is no more comprehensive and consistent directory available in this respect. Of the overall population of approx. 580 investors<sup>46</sup> a total of 103 investors were invited to participate (approx 18 % of population), of whom 46 provided a completed questionnaire (equals to 45 % of sample).

Figure 5: Composition of Survey Group



Own Illustration

The survey comprises an electronic questionnaire based on a standard set of questions to obtain both quantitative and qualitative responses. In order to simplify the evaluation many of the questions were multiple choice, by means of a drop-down menu. A specimen questionnaire including results is attached as appendix IV and V of this thesis. The key conclusions are set out in the following section.

## 4.2 Results of Questionnaire

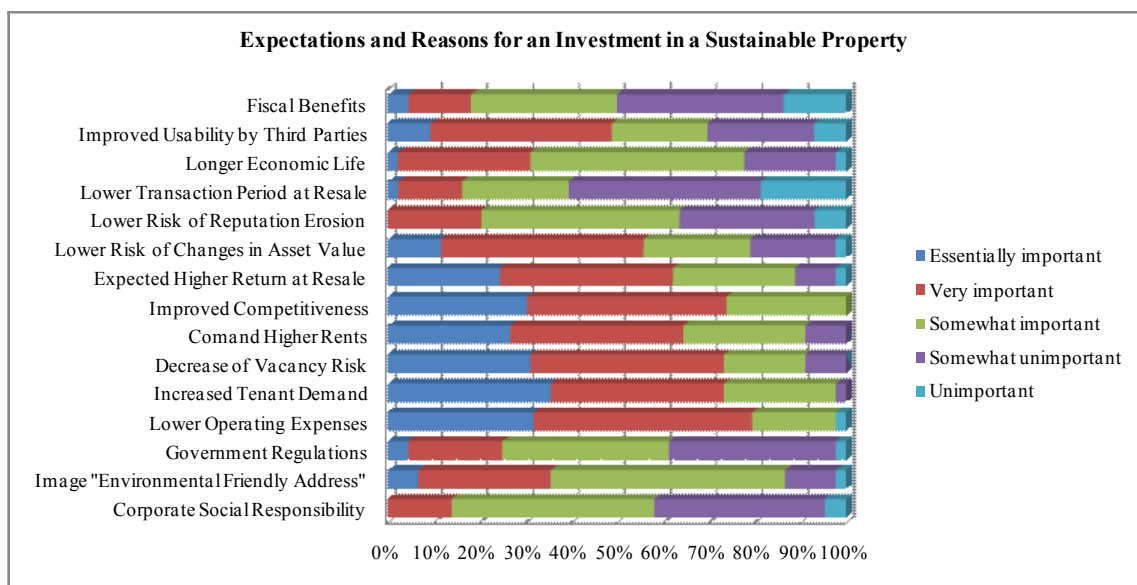
The results of the survey show that more than 40 % of the investors already have sustainable properties within their existing real estate portfolio, in their own judgement rather than desig-

<sup>46</sup> see Expo Real (2009)

nated by a certification. The survey also found that sustainability has gained in importance among investors as the majority of private and institutional investors expressed an interest in sustainable investment products, with 85 % of the respondents stating that they have the intention of investing or renting sustainable properties or space. Thus far, the significance of sustainability aspects on purchase decisions however appears to be considered as fairly mediocre. Only 37 % of the respondents regard sustainability aspects as essentially important or very important in their investment decisions, alongside economic criteria such as rent and yield. However 72 % of the investors consider sustainability of real estate to be highly relevant in the future; building quality fundamentals as such will, according to the investors' responses, come more to the fore and sustainability aspects will gain in importance due to the current economic situation.

Real estate investors were additionally asked to state their expectations in respect of which criteria they regard as relevant in affecting when they invest in sustainable instead of conventional real estate. As shown in the chart below, the respondent investors consider issues such as improved competitiveness (74 %), reduced risk of the building being unoccupied and increased tenant demand (each 73 %) as well as lower operating costs (80 %) as very or essentially relevant for sustainable real estate investments. Additionally, expected higher returns at resale (62 %) and higher achievable net rental income (64 %) are also regarded by a majority as being very or essentially important, indicating that sustainability has to be economically feasible for an investor's property investment decision.

Figure 6: Expectations and Reasons for an Investment in a Sustainable Property



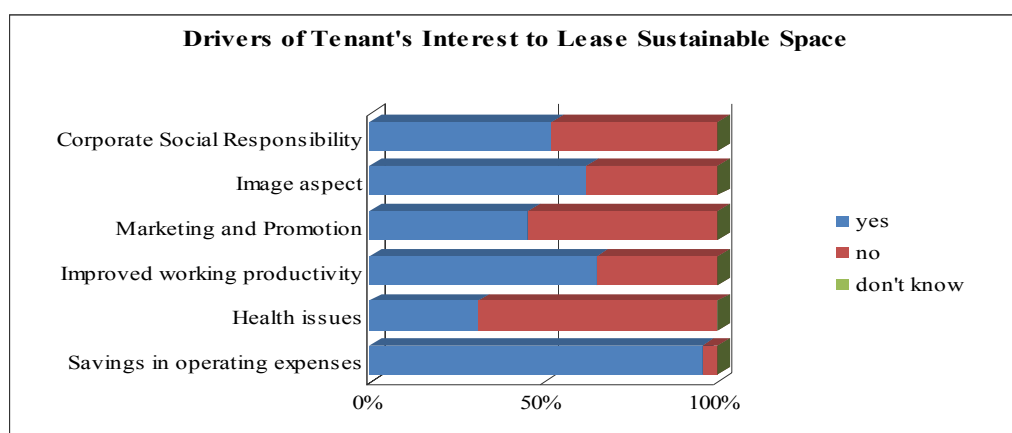
Own Illustration

“Green thoughts” such as statutory requirements and government regulations, image aspect of an “environmentally friendly address” and corporate social responsibility (CSR)<sup>47</sup> were regarded as less important.

<sup>47</sup> According to the World Business Council Corporate Social Responsibility is defined as “the continuing commitment by business to contribute to economic development while improving the quality of life of the workforce and their families as well as of the community and society at large”. See World Business Council for Sustainable Development (2000), page 6.

The main interest and the most important drivers for potential tenants to lease sustainable space as seen by investors is, according to the overall result of the survey, the effect of the sustainable features on the profitability of the company. More than half of the respondents confirm that there is an increased tenant demand for sustainable space. 96 % of the investors are of the opinion that the main reason for tenants renting sustainable space is operating cost savings due to lower energy costs. Improved employee productivity is seen as a further major (65 %) determining factor. Factors such as image (62 %) and corporate social responsibility aspects (52 %) are of more moderate importance. Reduced incidence of sick-building syndromes (45 %) and improved marketing benefits<sup>48</sup> (45 %) are regarded by the respondent investors as less important to potential tenants.

Figure 7: Drivers of Tenant's Interest to Lease Sustainable Space



Own Illustration

A recent survey jointly conducted by CoreNet Global and Jones Lang LaSalle globally during 2008 also confirmed that there is increasing evidence that tenants view sustainability as a determining factor in their property decisions and sustainability is on the corporate agenda.<sup>49</sup> Large international businesses in particular are recognising growing pressures; from resource depletion through increased legislation and rising customer expectations to exposure to criticism from the media. In response to such concerns raised by the media, consumers, employees and shareholders, corporate social responsibility agendas are driving demand for sustainable property. Increasingly companies incorporate sustainability aspects in their company's mission statement. An example is provided by Siemens, which has a target of reducing company-wide CO<sub>2</sub>-emissions by 20 % by 2011 compared to 2006<sup>50</sup> and by Coca-Cola, which only leases space in LEED certified buildings.

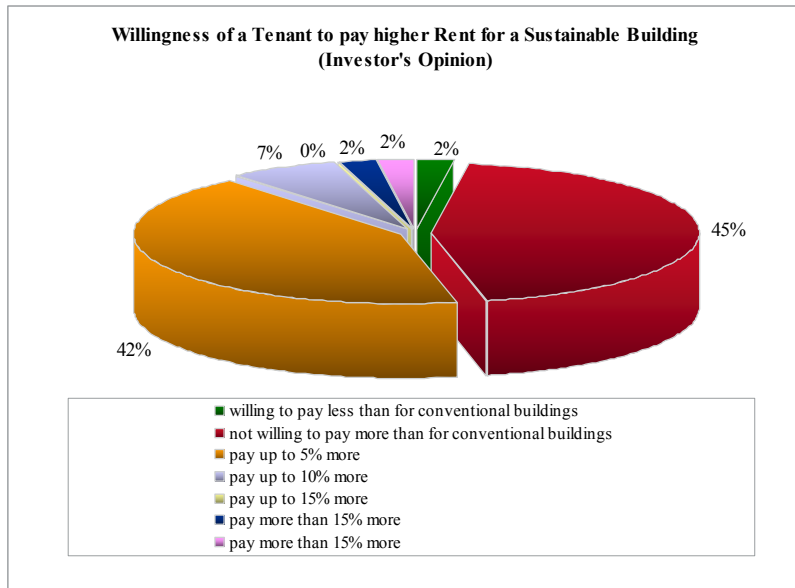
The survey additionally found that 45 % of responding investors are of the opinion that tenants are not yet prepared to compensate owners for the additional costs of sustainable buildings through higher net rent payments. Only some 42 % of the investors opined that tenants may be willing to pay up to 5 % higher net rents in return for the savings in energy costs.

<sup>48</sup> Marketing benefits means e.g. that tenants may promote the sustainable lease.

<sup>49</sup> see CoreNet Global and Jones Lang LaSalle (2008), page 4.

<sup>50</sup> see Siemens (2008), page 7.

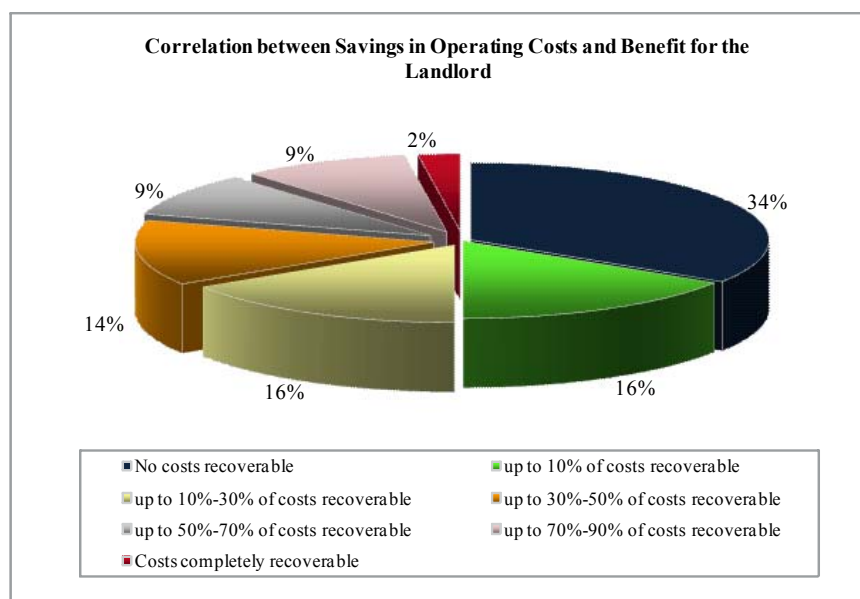
Figure 8: Tenant's Willingness to pay higher Rents for a Sustainable Building



Own Illustration

The additional construction costs can only be amortised by the savings in operating costs over the long-term. Operating cost savings however still play a subordinate role in lease negotiations with tenants. Additional construction costs are, according to the majority of the investors (34 %), not recoverable from tenants. This is may be due to the fact that potential tenants do not have evidence of the levels of operating cost savings they can realistically expect over their future lease term. The implementation of government regulations<sup>51</sup> will oblige landlords to invest and provide economic pressure to act. German tenancy law does not allow landlords to pass on the additional construction costs of sustainable commercial buildings to tenants. This is only possible via a special contractual agreement, but is not permitted simply as part of a usual lease.

Figure 9: Correlation between Operating Cost Savings and Benefit for Landlord

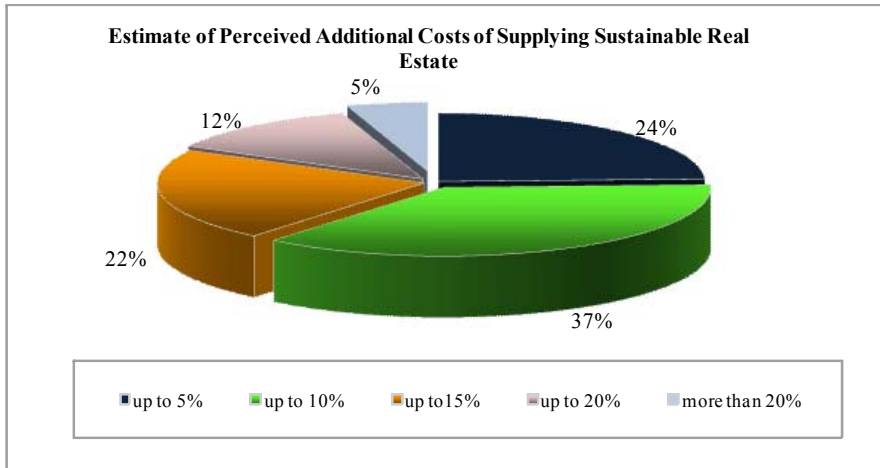


<sup>51</sup> see section 2.2.1 of this thesis.

Own Illustration

Although several studies show that the extra costs of building sustainably are fairly small<sup>52</sup>, the majority of the responding investors (37 %) assume that sustainable properties entail substantially higher investment costs and estimate the additional construction cost to be up to 10 %.

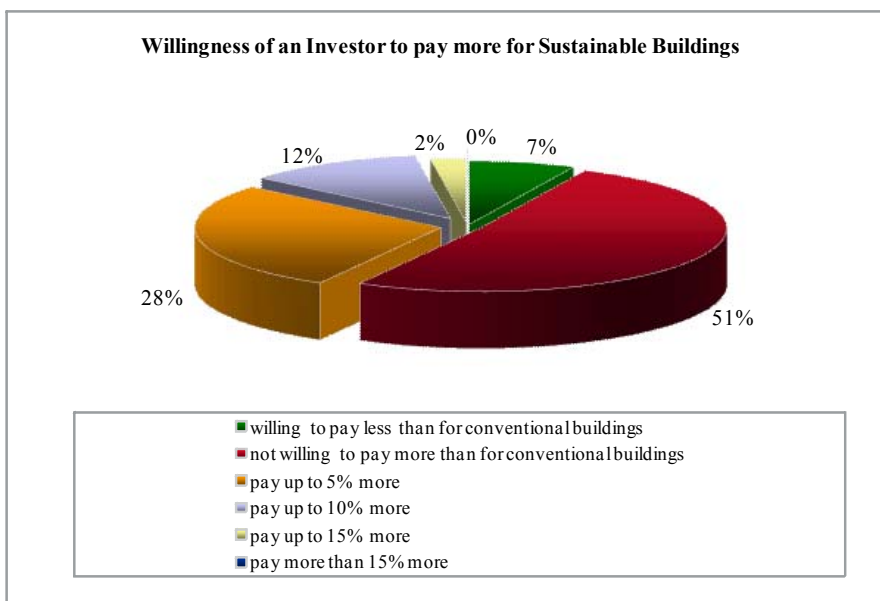
Figure 10: Estimate of Additional Construction Costs for Sustainable Buildings



Own Illustration

Rational behaviour by investors, developers and occupiers is linked to requirements for optimisation of return combined with risk containment. The majority of responding investors expect that an improved return is achievable from a sustainable property compared to that from a conventional building but currently only 28 % of the respondents are willing to pay a higher purchase price (higher multiple) of up to 5 %. More than 50 % of the respondents are unwilling to pay more than for conventional buildings.

Figure 11: Investor's Willingness to Pay More for Sustainable Buildings



Own Illustration

<sup>52</sup> see section 3.1 of this thesis.

---

An investor will only regard a sustainable real estate investment as competitive from an economic point of view if the additional construction costs for the sustainable features are compensated for by an increase in asset value. The question as to whether the increased capital costs are offset by the net present value of the economic benefits of sustainable investments was answered positively by 53 % of all respondents for properties in prime, mostly central business district locations, whereby for secondary or poor locations the majority of investors (30 % and 13 % positive response respectively) regard such an investment as economically not reasonable.

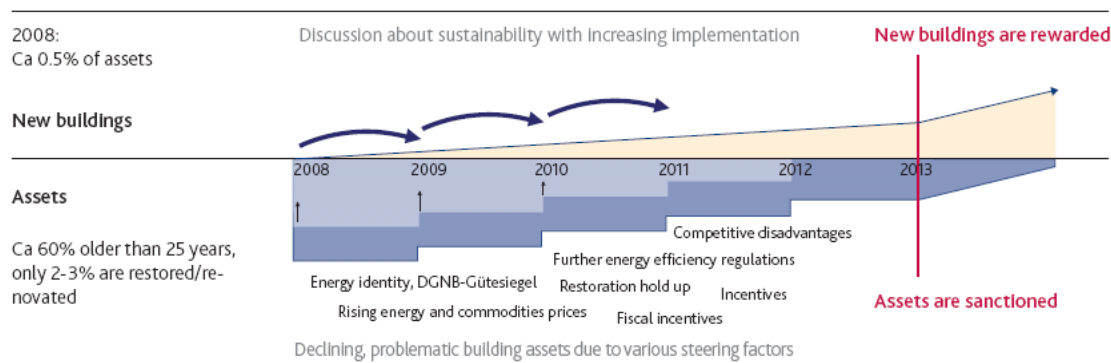
#### 4.3 Conclusion

The survey shows that sustainable property issues are gaining in importance in investors' considerations and that there is increasing awareness of the benefits of sustainable properties. In the US and Australia certified sustainable buildings enjoy increased appreciation as shown in the results of the empirical studies described in section 0 of this thesis. In contrast to this there are according to the results of the survey conducted by the author of this thesis, thus far no identifiable financial benefits for investors in the form of higher asset values in Germany, with the exception of properties in prime locations. The major obstacle to the uptake of sustainable development is the yet unknown relationship between benefits and costs of sustainable development.

The results of the survey show that investment decisions are made almost exclusively in accordance with financial considerations, as investors are mainly driven by monetary actions and sustainable investments have to compete under economic considerations. In order to be compensated for the additional costs of certified building construction, investors require a combination of higher income and/or reduced risk. This however requires that tenants are willing to pay higher net rents, which is, according to the results of the survey, not the case, although the ultimate benefits of energy savings, higher productivity and less employee absenteeism accrue to the tenant. It is essentially important to prove the financial advantages to the tenant on the basis of future empirical studies in order to justify higher rents and that investors are able to understand and quantify the benefits of (the different levels of) sustainability.

As the results of the study show, the competitive position of sustainable buildings is expected to further improve in future as investors and tenants consider sustainability as an increasingly important factor for investment decisions. A socially responsible investment will increasingly become the standard in the industry as awareness begins to develop that disregarding the value-retention aspects of sustainability will lead to value-, performance- and image losses in future. Non-sustainable buildings will become fewer in the medium to long-term not only due to increasing energy and commodity prices, but also due to energy efficiency regulations, so that market participants will start to penalize unsustainable buildings as shown in the following chart.

Figure 12: Future Development of the Sustainability Property Market in Germany



Source: DEGI Research (2008), page 4

It is therefore to be expected that owners will come to expect either discounts to become common for non-sustainable buildings, as unsustainable space becomes more difficult to re-let and a lower market rent is achievable or that premiums will be paid for sustainable properties due to increased demand.

## 5 Sustainability in Property Valuations

This chapter looks at the rationale for the consideration of sustainability issues on the basis of the triple bottom line concept<sup>53</sup> in property valuation. The focus of this chapter is to identify the key important variables that valuers should consider when assessing the market value of sustainable buildings and shows obstacles that may arise by doing so. To adequately look at the theoretical impact of sustainability on property values it is initially necessary to view the concept of value and to give a brief description of property valuation methods which is provided in the original master thesis document.

Lützendorf and Lorenz consider that traditional valuation approaches such as Discounted-Cash-Flow or the static Investment Method may not be suitable to evaluate a building's environmental and social performance. They argue that "Relying on historical valuation methods will lead to an unbalanced approach for determining a property's exchange price or Market Value."<sup>54</sup> They recommend that advanced valuation methods such as hedonic pricing techniques<sup>55</sup> may be used but note that difficulties of describing and assessing the different building features and the lack of large and appropriate data sets exist.<sup>56</sup> They also mention that "many valuers might not have the facilities, required skills and probably motivation to use those techniques. They are therefore likely relying on traditional valuation approaches in the foreseeable future"<sup>57</sup>. Boyd is of the opinion that the traditional valuation methods have the flexibility to assess the impact of environmental and social factors on financial performance and "that the advanced methods do not replace the traditional approach"<sup>58</sup>, but may be supplement traditional methods assuming

<sup>53</sup> For the triple bottom line concept please refer to section 2.1 of this thesis.

<sup>54</sup> Lützendorf, T. and Lorenz, D. (2005), pages 228-229.

<sup>55</sup> For a description of this method please refer to the original master thesis.

<sup>56</sup> German real estate markets appear to be not very transparent and price information are quiet difficult to get as compared to other countries such as UK or US.

<sup>57</sup> Lützendorf, T. and Lorenz, D. (2005), page 228-229.

<sup>58</sup> see Boyd, Terence (2005), page 4.

---

that reasonable market data is available. The author investigates whether traditional approaches are able to reflect sustainability in the following sections.

## 5.1 Sustainability Factors and Theoretical Linkage to Value

To determine the theoretical impact of sustainability factors on value it is necessary to analyse the features and characteristics of sustainable properties in order to derive the resulting general economic and financial advantages.

The theoretical environmental, social and (to some extent) economic benefits of sustainable buildings are researched, documented and illustrated in various literature. The obvious financial benefit of sustainable buildings is the saving in energy cost, repairs and maintenance costs and waste reduction leading to lower operating expenses. In Germany operating expenses of commercial buildings are typically paid by the tenant (net lease). A net lease thus provides no direct benefit to the owner, although the tenant will benefit from lower operating costs.<sup>59</sup> A tenant with a net lease who rents space in a sustainable commercial building, with associated savings in operating costs, may be willing to pay a higher rent per square meter if the tenant can identify long-term savings. On the other hand it can be argued that tenants will pay a lower rent for inefficient non-sustainable assets, due to the extra allowance needed for the additional direct or indirect costs. The financial benefits of energy savings and waste reduction can be measured fairly precisely by using the energy performance certificate (Bedarfs-Energieausweis) which specifies the total energy-related operating costs (e.g. electricity, gas, oil).<sup>60</sup> The property owner may additionally save repairs and maintenance costs due to the use of less and better integrated engineering systems.<sup>61</sup>

Beside the above mentioned savings there are a number of intangible benefits, which cannot be described through the change of construction or user costs. The RICS (2005) case study points out that “perhaps the largest single area of value from green buildings lies in the ‘soft’ gains that can be difficult to value with conventional accounting methods”<sup>62</sup>. An example of a soft gain is healthier employees with fewer absences and better productivity due to better air quality and lighting. Such a building thus may provide a company (tenant) with a competitive or cost advantage, help it meet its corporate responsibility targets and improve its standing with investors and customers. An improved interior environmental quality might result in higher employee productivity. The relation between employee productivity and building design/operation is however very complex to measure and the financial impact of healthier and more comfortable sustainable buildings is difficult to assess, in part because “the costs of poor environmental quality [e.g. lower productivity, higher absenteeism] may simply be hidden”<sup>63</sup>. A healthier environment leads to better performance and thus economic benefit for the tenant. The tenant which is the entity that benefits from the improvements is however not always the entity that provides the

---

<sup>59</sup> Over the lifecycle of a property, approximately 80 % of all costs are for its operation. Energy represents 50 % of these costs in a building. see Ernst & Young (2008), page 26.

<sup>60</sup> see section 2.2.1 of this thesis.

<sup>61</sup> e.g. Use of Contracting-Heating systems whereby the heating system is owned by a contracting company providing heating to property occupiers on the basis of a management contract. Repairs and maintenance of the heating system are carried out by the contracting company thus reducing the costs for the property owner.

<sup>62</sup> RICS (2005), page 5. The author understands that the term ‘green’ has been used synonymously for the expression ‘sustainable’.

<sup>63</sup> Eichholtz et al. (2009), page 12.

---

space (investor/property owner). The benefits to the tenant may lead to reduced risk of an unoccupied building for the investor and the tenant may be willing to pay a higher net rent. The translation of work performance into economic value for the investor is however difficult to assess.

Additionally there might be a positive image gain for tenants due to the fact that leasing space in a sustainable property may send a signal that the tenant is socially responsible. An organisation's approach to CSR may affect its considerations about occupying a sustainable building, because of perceived benefits to reputation, health and productivity of employees, or impacts on the environment or society. This can in turn, affect the perceived value of a commercial building as it could be argued that a company with a transparent CSR policy would find greater acceptance in broader society, which in turn may be converted to higher demand by prospective shareholders. Consequently, tenants may be willing to pay a higher rent. Orlitzky and Benjamin (2001) address the relation between corporate social performance and risk, and argue that the better a firm's social reputation, the lower the total market risk.<sup>64</sup> Eichholtz, Kok and Quigley point out that if this relationship also applies to the real estate sector, developing sustainable buildings may result in lower cost of capital and higher property values, even if higher rents are not achievable in sustainable properties.<sup>65</sup>

Sustainable certified buildings may also be subject to marketing benefits as sustainability provides an opportunity to market the sustainable building as differentiating from competing buildings from an investor's perspective or promote the sustainable lease as benefiting the tenant's image. An occupant's decision to rent space in a building may depend on a property's certification. This effect can have an impact on the demand of buildings.

Sustainable buildings should, have a longer economic life due to less depreciation and lower volatility in Market Value due to less environmental and marketability risk. Sustainability features have the ability, to varying degrees, to slow depreciation and obsolescence (especially physical, functional and/or economic obsolescence) in a commercial building over the long term. This leads to reduced risk premiums.

Benefits to tenants/occupiers may also be apparent when a commercial building is located closer to the labour market, resulting in environmental effects such as transport cost savings and reduced smog. Furthermore, a building may require lower "embodied" energy due to the use of local construction materials instead of imported materials. These benefits are difficult to measure accurately but "they may be attributes that stakeholders can identify and be willing to pay more for"<sup>66</sup>.

According to the literature sustainable buildings may also have impact on the following property-specific risks<sup>67</sup>:

- reduced vacancy risk due to higher attractiveness of the building from an occupier's perspective

---

<sup>64</sup> see Orlitzky, M. and Benjamin, J.D. (2001), pages 369-396.

<sup>65</sup> see Eichholtz et al. (2009), page 13.

<sup>66</sup> Reed, Richard (2007), page 8.

<sup>67</sup> see RICS (2007), page 18-19; Lützendorf, T. and Lorenz, D. (2008), page 5; Lorenz, David (2008 a), page 2; Horster, Herman (2009), pages 31-32; RICS (2005), page 19; Lützendorf and Lorenz (2007/2008), page 63.

- reduced risk of tariff changes for energy, water supply and disposal
- reduced appearance of Sick-Building Syndromes
- lower legislation and liability risk
- lower risk changes in the market

The following overview summarises the author's view of the connections between the characteristics of sustainable buildings and the hence resulting economic and financial influences on property value:

Table 3: Sustainable Factors and Economic Benefits

Sustainable Factors and Economic Benefits				
	Sustainable Factors	Benefiter		Economic Impact on Property Value
		Property Owner	Occupier	
1	Savings in Operating Costs: Energy (incl. reduced CO <sub>2</sub> -emission) and Water/Waste-water		x	Lower share of Operating Cost for Tenant may result in higher Net Operating Income (NOI)
2	Higher Occupant Productivity, Well-being and Health, fewer Absences, Advantages in Employee Development due to positive Image		x	Higher Tenant Demand may result in higher NOI, reduced Vacancy Risk and more stable Cash Flow result in shorter Vacancy Periods/reduced Risk Premium (higher Multiplier)
3	Demonstration of Corporate Social Responsibility	x	x	Higher Tenant Demand may result in higher NOI, Higher Investors Demand may result in higher Multiplier
4	Less Environmental and Marketability Risk, longer Compliance with increasingly stringent Environmental Legislation	x		Reduced Risk Premiums and lower Depreciation may result in higher Multiplier
5	Longer useful economic life of building	x		Less Depreciation may result in higher Multiplier
6	Improved Marketability and Reputation Gains (Image Advantage)	x	x	Risk Reduction due to better Re-lettability and Saleability, Impact on Building Demand, may result in higher NOI and/or higher Multiplier
7	Increased Competitiveness of the Property due to Property's Certification	x		May result in higher Multiplier
8	Transport Cost Savings, Better Indoor Air Quality through the Use of local Construction Materials		x	Higher Tenant Demand may result in higher NOI
9	Savings in Repairs and Maintenance Costs	x	x	Lower share of Operating Cost for Tenant may result in higher Net Operating Income (NOI)

Own Illustration

The overview above shows that an evaluation of economic benefits is always influenced by the perception of the individual market participant concerned. There are also effects on society and the environment which have not been illustrated in the table above due to the fact that assessment of Market Value implies that direct monetary advantages or reductions in property-specific

risks that are realised by the property owner or occupant of the respective building are reflected in the valuation whereby indirect or non-monetary benefits realised by the society or environment are not taken into account.<sup>68</sup>

A more detailed overview of the characteristics and features of sustainable buildings, their impact on property specific risks and the distribution of benefits and the theoretical linkage to value is attached to this document as appendix VII.

## 5.2 Reflecting Sustainability Issues in Property Valuation Methods

As shown in table 3 sustainability has the potential to affect a building's operation and the property's value through creation of both real and intangible benefits. In order to reflect these throughout the valuation process, the property's sustainability performance has to be assessed, when valuing a sustainable property which comprises the following attributes:

Table 4: Assessment of Sustainable Attributes in the Valuation Process

Assessment of Sustainable Attributes in the Valuation Process		
▪ Location Quality incl. Competition Analysis	▪ Building Quality	▪ Architectural Design
▪ Functionality, Flexibility, Adaptability	▪ User Comfort	▪ Infrastructure
▪ Quality of Construction Materials <sup>1</sup>	▪ Quality of Building Services	▪ Indoor Air Quality
▪ Energy Consumption	▪ Water and waste water Consumption	▪ Transport Costs
▪ Usability by Third Parties	▪ Impact of Subject Site on Neighbourhood	▪ Analysis of Operating Costs
▪ Supply and Demand of Sustainable Properties	▪ Analysis of Current Rent Payment	▪ Any other value-influencing Factors

<sup>1</sup>with regard to environment/health

Own Illustration, after Boyd, Terence (2005), pages 6-7

For the majority of these attributes the valuation professional can rely on the information from energy performance and sustainability certificates<sup>69</sup> if available. Once the above mentioned factors have been analysed the results have to be reflected in the specific valuation methods which is explained in the following sections.

### 5.2.1 Sales Comparison Method

Reflecting sustainability issues in the sales comparison method works best when a sufficient amount of comparable sales prices is available and “when the characteristics and attributes of these sales prices and of the subject property can be appropriately specified in order to avoid comparing ‘apples with oranges’”<sup>70</sup>. For sustainable properties, this can be challenging due to the lack of comparable sales that exhibit sustainable features and the differences in respect of

<sup>68</sup> see Lützkendorf, T. and Lorenz, D. (2008 a), page 498.

<sup>69</sup> see sections 2.2.1 and 2.2.2 of this thesis.

<sup>70</sup> Lorenz, David (2006), page 174.

---

the level of sustainability or degree of sustainability performance between buildings. In order to find appropriate sales comparables, valuers can rely either on building descriptions, energy and sustainability certificates or on personal judgment requiring valuers to know which building features are necessary in terms of an appropriate sustainability performance and to be equipped with knowledge on the benefit of sustainable design.

### 5.2.2 Income Method

When using the income method the major valuation input parameters are market rent, operating costs and capitalisation or discount rate which can all be affected by sustainable features.

Sustainable design can significantly reduce operating costs which results in higher net operating income but most sustainable features affect operating expenses that are usually attributable to the tenant such as costs for water, heating, cooling and electricity. Sustainable features can also reduce the costs for repair and maintenance and management which are often attributable to the property owner in Germany. A valuer has to take these cost reductions into account when calculating the net operating income.<sup>71</sup> German valuation theory and practice intends not to estimate property-specific operating costs but uses average figures instead which mainly depend on property type and building age.<sup>72</sup> This valuation practice can be considered inappropriate for reflecting sustainability issues because when the same average figures are used for all valuation assignments, then sustainable buildings are penalised and conventional ones are rewarded.

Sustainable design can also affect market rent as a tenant may be willing to pay more to lease space due to the intangible benefits in a sustainable building explained in section 5.1 of this thesis. It may however be difficult for valuers to justify a higher market rent for sustainable buildings when they are unable to find comparable properties.<sup>73</sup>

Sustainability issues may also reduce future property-specific risks<sup>74</sup> and may lead to more stable cash flows due to increased tenant demand which has to be reflected indirectly in the choice of a lower capitalisation rate<sup>75</sup> when using a static income approach.

In German valuation methodology in addition to adjustments of sustainable rent, non-recoverable expenses and capitalisation rate, the remaining useful life of the building may be longer than that of conventional buildings due to reduced depreciation and obsolescence. In the international static approach this is usually reflected in the choice of the capitalisation rate.

---

<sup>71</sup> There are no guidelines in respect of the assessment of the non recoverable costs in the international Income Capitalisation Method. The assessment of the non recoverable costs is the valuer's own discretion (content of lease contracts and market condition have to be considered).

<sup>72</sup> In the German Income Method according to German valuation theory and practice average non recoverable cost figures (vacancy & collection loss, management costs, repairs and maintenance costs) are used depending on property type and age of building. These figures can be found in WertV (Wertermittlungsverordnung) and WertR (Wertermittlungsrichtlinien) (both German valuation guidelines). German valuation guidelines do not recommend any average figures for non recoverable operating expenses.

<sup>73</sup> As demonstrated by the results of the study carried out amongst German investors (please refer to section 4 of this document) sustainable design is not reflected in the current rental value of these buildings.

<sup>74</sup> An extract of the impact of sustainability on property specific risks is described in section 5.1 of this document and in appendix VII.

<sup>75</sup> The choice of the capitalisation rate for the respective subject property depends on the capitalisation rate of comparable transactions and consists of the following components: risk free rate + risk premium – growth + depreciation.

---

In contrary to the static approach, in a DCF approach sustainable characteristics are explicitly reflected by adjusting the following valuation input parameters:

- *Market rental level*: Occupants may be willing to pay more as a result of tangible and intangible benefits.
- *Rental Growth*: Rental growth assumptions may be higher due to reduced risk and willingness of tenants to pay a higher net rent.
- *Expenses*: Future savings in operating costs, repairs and maintenance costs as well as reduced capital expenditures will be explicitly reflected in the appropriate cash flow period.
- *Tenant renewal probability*: Due to indirect benefits such as lower staff turnover and absenteeism, a tenant may be more likely to renew a lease in a sustainable commercial building. Tenant fit-out costs and incentives (such as rent-free periods) and absorption periods are among other issues that may be affected, and may require adjustment on the basis of comparable evidence.
- *Vacancy assumptions*: Sustainable design features may result in lower current and future vacancy rates due to an increased level of tenant demand.
- *Discount Rate*: More sustainable features may be perceived as having lower risk, resulting in a lower discount rate.
- *Exit value*: Since the life span of a sustainable building may be longer than that of a conventional structure, valuers have to consider the effect of depreciation and obsolescence (e.g. functional, physical and economic) and what adjustments need to be made to investment capitalisation. The challenge is whether and how the longer lifecycle will affect capitalisation rate and thus yield and multiple. Additionally, the perception of the market towards sustainable responsible investments (supply and demand over cash flow period) has to be reflected.

The overview attached to this document as appendix VIII summarises how perceived sustainability aspects may be incorporated into the valuation process using static international, German or DCF methodology.

### 5.3 Obstacles in Assessing the Value of Sustainability

The section above has proven that traditional valuation approaches are in theory generally able to adjust for and reflect sustainability issues, however there are some barriers to assessing the value of sustainability.

The problem for valuers is that they do not know how exactly to adjust the various valuation input parameters in order to reflect the benefit of sustainability features correctly, as it is difficult to assess how much of the intangible benefit is actually passed on to the property owner. It is important to note that the valuation needs to account for sustainability issues only to the extent to which these issues impact on the competitive position of property assets in the marketplace. The best way to evaluate intangible attributes is to find rent and sales comparables in the market place.

The basic principle of all property valuation methods is comparison and valuation input parameters are based on market-derived information. The nature of real estate is that every parcel of

---

land is unique and heterogeneous, so that properties not only differ in terms of location, lease term, building quality and design among other characteristics but also in the level of sustainability ranging from minor to major sustainable initiatives. To find rental and sales comparables for sustainable properties can thus be challenging for valuation professionals due to the lack of comparable sales that exhibit sustainable features and the differences in respect of the level of sustainability or degree of sustainability performance between buildings. Furthermore the property market is very decentralized so that transaction data is not always readily available. Property transactions often take place without the knowledge of all market participants and information concerning the transaction are often only incompletely released thereafter.<sup>76</sup> Due to the competitive nature of the property market, tenancy and rental payment details in particular are often kept secretly by the transacting parties involved.

Furthermore a price observed in a comparable sale may not be indicative of Market Value because real estate trades in a relatively inefficient market and prices resulting from particular transaction depend on the negotiating strength of the purchaser and seller.<sup>77</sup> Property valuation should thus always take into account any changes in the market participants' views of the benefits associated with the ownership of real estate. If the market participants recognise additional benefits in the ownership of sustainable buildings valuers have to consider this in assessing a property's Market Value.

Additionally there is usually a time lag until all information about recent sales is available to the valuer. This lack of free availability in respect of reliable and up-to-date market data further complicates the valuation process, as actual demand drivers cannot be easily identified. However, with changing influences such as sustainability, it is essential that valuation professionals remain as up-to-date as possible.

In addition, one of the valuer's fundamental challenges is to identify and separate the different sustainability attributes that influence the property's value in order to adjust the respective valuation input parameters and to understand how these attributes influence different value components.<sup>78</sup> This is extremely difficult as it is a combination of the different value components that influences a property's Market Value.

Moreover, the quantification of the advantages of sustainable properties and translating these into monetary values is however, with the exception of operating cost savings, which can be measured directly, only possible to a limited degree. It is very difficult to prove the benefits of sustainable buildings due to the lack of detailed information on different building, characteristics and associated performance and to define with certainty which indicators and measures are a sign of good economic performance. So far only a few empirical studies have been published.<sup>79</sup> This makes it difficult to know to what degree to reflect such factors in valuation. There is further research needed in this field leading to a clearer quantification of the intangible benefits (e.g. productivity improvement, enhanced reputation etc.) and their impact on value. It

---

<sup>76</sup> Once a transaction in Germany has taken place the purchase agreement is released to the local municipality authority (GAA – Gutachterausschuss) which analyses and collects the data in purchase price records (Kaufpreissammlung). Additionally large real estate companies have set up their own transaction databases.

<sup>77</sup> see Lützkendorf, T. and Lorenz, D. (2005), page 220.

<sup>78</sup> see section 5.2 and appendix VIII of this thesis.

<sup>79</sup> see section 0 of this thesis.

---

is also important to know to what extent any of these sustainability issues are addressed in current property valuations.

## 5.4 Recommendations

It appears that as additional information in the form of comparable rent and sales evidence with regard to sustainable commercial buildings becomes available, valuers will be able to accurately incorporate this information in the assessment of value during the valuation process. The author has identified and carried out a critique of a number of recommendations from various authors on improving sustainability data availability in order to facilitate the consideration of sustainability aspects in property valuation.

### 5.4.1 Consideration of Sustainability Certification in Property Valuation

In order to reflect sustainability features throughout the valuation process, the valuer has to initially assess the degree of a building's sustainability performance as described in section 5.2 of this thesis. Sustainability certificates such as BREEAM, LEED or DGNB<sup>80</sup> which document the sustainable characteristics can make a contribution to property valuation by providing information for implementation in the valuation process. In the absence of these an eco-assessment to assess the building's contribution to sustainable development should thus be undertaken as part of a technical due diligence process. The assessment should review the sustainability and energy performance of a building<sup>81</sup> and should additionally provide a general orientation on the status quo or current degree of fulfilment of sustainability criteria of a building with respect to sustainability certification. Moreover, in the event that a building is not certifiable in its current condition then the eco-assessment should give advice on the course of action required in order to improve the building's sustainability performance.

In this context valuation professionals should be encouraged to undertake learning about sustainability issues to improve their understanding of sustainable buildings and their performance.

### 5.4.2 Economic Sustainability Indicator

Sustainability certificates help that they designate a building as sustainable but do not contribute to estimating the economic impact on Market Value. To establish a link between sustainability and its economic performance the results of the sustainability certifications should be integrated into an economic sustainability indicator and should function as an add-on to traditional valuation methods which allows the economic advantages of sustainable buildings to be displayed, as well as the disadvantages of non-sustainability to be treated as additional risk factor.

The economic sustainability indicator could be based on the existing sustainability certification systems and comprise a set of the suitable sustainable property performance criteria which have an economic influence on property value e.g. location of a building, architectural design,

---

<sup>80</sup> Please refer to section 2.2 for detailed information in respect of these sustainability certificates.

<sup>81</sup> The obligatory energy efficiency certification which has been introduced in Germany is of assistance in evaluation the energy efficiency standard of a building (please refer to section 2.2.1 of this thesis). This should provide a (calculatory) usage certificate with an advantage in questions of evaluation and for existing buildings additionally provide the real (and weather adjusted) energy consumption. The energy certificate provides indicators of the degree of conformity with EnEV regulations, the insulation of the building shell and the consumption of energy types (e.g. gas, electricity).

---

adaptability and flexibility as well as energy costs. Market participants perception of sustainability also needs to be considered. Further research should be done to obtain market evidence and to gain insights into occupants' and property owners' demands in order to establish this set of sustainable performance criteria. It is important to identify which sustainable aspect in a commercial building adds value and how much. The selected sustainability performance criteria should then be weighted and combined to result in an economic sustainability indicator. The weighting should depend on the characteristics of particular market segments as they must reflect markets participants' preferences and the degree of awareness of the benefits. Furthermore it is important to consider that the weighting and selection of the respective sustainability criteria may change over time as the market participant's perception towards sustainability changes.<sup>82</sup> This is a very brief description of how an economic sustainability indicator could be designed and is suggested as a subject for further research. The indicator has not yet been published.

The University of Munich together with Feri EuroRating Services is currently working on the translation and quantification of sustainability benefits into economic value on the basis of the existing sustainability certification systems. The indicator thus derived would then be reflected in value input parameters such as rent and the building's useful life span.<sup>83</sup>

The University of Zurich has already developed such an indicator examining features such as flexibility, safety, accessibility, energy consumption as well as health and comfort, weighting and combining these factors under risk aspects. The economic sustainability indicator reaches values of between 1 and -1 (a value of 1 means a maximum degree of sustainability, a value of 0 means an average degree of sustainability and -1 means a maximum degree of Non-sustainability.<sup>84</sup> According to the developers of the indicator, this can be considered as a property-specific risk in the capitalisation rate so that properties, which have the ability to deal well with changes in external conditions such as long-term global climate change, change in energy prices or demographic population change, will be evaluated higher than they would by traditional valuation methods and vice versa. The impact of the economic sustainability indicator on a property's Market Value should be, according to the University of Zurich, in a range of between +/- 10%. This author does not however regard a rigid limit for the range of value corrections as appropriate. In addition in the assessment of economic sustainability indicators the sub-categories are all weighted equally. A more precise and appropriate weighting schema should be adopted.

Sayce and Ellison have developed an appraisal model together with the Kingston university that allows incorporating sustainability issues into calculations of value. They have established a set of different sustainable criteria<sup>85</sup> in connection with the use of the traditional cash flow approach to assess the value of sustainable properties. They adjust key variables (rental growth, depreciation, risk premium and cash flow) for the various sustainability criteria and assess the value of

---

<sup>82</sup> E.g. Increasing demand and limited supply for sustainable buildings currently in the marketplace results in that demands exceeds supply. In the future this may change, as more sustainable buildings enter the market.

<sup>83</sup> see [http://berlin.business-on.de/nachhaltigkeit-und-immobilien-neues-rating-fuer-immobilien-geplant\\_id10156.html](http://berlin.business-on.de/nachhaltigkeit-und-immobilien-neues-rating-fuer-immobilien-geplant_id10156.html) ; Immobilienzeitung (2009), page 5.

<sup>84</sup> see University of Zurich (2007), page 12 – 13.

<sup>85</sup> Sustainability criteria comprise: accessibility, building quality, adaptability, occupier satisfaction, pollutants, contextual fit, energy efficiency, water and waste and occupier impact.

---

each property using standard valuation factors and thereafter using the weighted sustainability criteria in addition to the standard valuation factors. Their findings is that the incorporation of the weighted sustainability criteria reduces the value of any property that fails to meet sustainable criteria.<sup>86</sup> Selection, classification and weighting of the sustainability criteria were based on consultations with property professionals, investors and occupiers who participated in the research project. Lorenz notes that this only represents the assumptions of a particular group of investors. “However, whenever the purpose is to estimate Market Value [...] then sustainability criteria (and their relative importance) on which to base valuations should be derived from market evidence”<sup>87</sup>. He further states that this can be, in theory, derived from advanced property valuation methods as mentioned above.<sup>88</sup>

#### 5.4.3 Improved Documentation in Transaction Databases

Empirical evidence of the economic advantages of sustainable properties which is required by valuation professionals to make necessary adjustments to parameters in the valuation process, obviously depends on the availability of well-documented information. At present there is relatively little information in respect of sales and leases instantly available in the open market relating to sustainable commercial buildings compared to the US or UK. To establish a correlation between sustainability-related features and observed property prices it is thus essential to improve the information and data basis as some important characteristics and features which are key parameters for evaluating their contribution to sustainable development are not yet adequately described and documented in existing purchase price records (Kaufpreissammlung) established by GAA<sup>89</sup> and transaction databases usually set up by large real estate companies. Building descriptions in existing purchase price records and transaction databases in Germany are usually compiled from information only of types 1 and 2 shown in the table below.

---

<sup>86</sup> see Sayce, Sarah and Ellison Louise (2006).

<sup>87</sup> Lorenz, David (2006), page 180.

<sup>88</sup> see Lorenz, David (2006), page 180.

<sup>89</sup> GAA - Gutachterausschuss (Municipal Land Authority)

Table 5: Types of Building Descriptions

Type	Description	Sample
1 <b>Quantitative Building Characteristics:</b> Statement on existence, age, number and scale of certain building features	<ul style="list-style-type: none"> <li>▪ Size of lettable area/usable floor space</li> <li>▪ Technical equipment: heating system, air conditioning,</li> <li>▪ Building features: facade, windows, sanitary installations, ceilings</li> <li>▪ Year of construction/modernization</li> </ul>	<ul style="list-style-type: none"> <li>▪ Lettable area: 5,000 m<sup>2</sup>, gross floor area: 6,000 m<sup>2</sup></li> <li>▪ Equipped with district heating, air-conditioning, sprinkler system</li> <li>▪ Masonry facade, double glazed aluminium windows, suspended ceilings, tiled roof</li> <li>▪ Constructed in 1985, completely refurbished in 2005</li> </ul>
2 <b>Qualitative Building Characteristics:</b> based on subjective assessment of valuer	<ul style="list-style-type: none"> <li>▪ Building quality: good/medium/ poor existence of maintenance backlog</li> <li>▪ Quality of lettable space: convenient layout</li> <li>▪ Assessment of third party usability</li> </ul>	<ul style="list-style-type: none"> <li>▪ Good building quality</li> <li>▪ No maintenance backlog</li> <li>▪ Convenient layout</li> <li>▪ Good usability by third parties</li> </ul>
3 <b>Sustainable Building Characteristics:</b> Score based assessment of sustainable building characteristics	<ul style="list-style-type: none"> <li>▪ Degree and conformity with Energy Efficiency Regulations (Energy Performance Certificate)</li> <li>▪ Level of sustainability rating in accordance with sustainability certification systems (DGNB, Leed, Bream)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Property is energy efficient in accordance with EnEV</li> <li>▪ Sustainability Rating: DGNB Bronze (Building Rating 2.05, Location Rating 1.78)</li> </ul>
4 <b>Performance based Building Characteristics:</b> Assessment of sustainable property rating/ sustainability indicator	<ul style="list-style-type: none"> <li>▪ Operating costs</li> <li>▪ Degree of functionality, flexibility, adaptability of building</li> <li>▪ Life-cycle costs</li> <li>▪ User satisfaction</li> <li>▪ Consumption of resources and environmental impact</li> </ul>	<ul style="list-style-type: none"> <li>▪ Operating Cost Savings of 25 % compared to conventional building</li> <li>▪ Net Rent Payment</li> </ul>

Own Illustration, after Lütendorf and Lorenz (2007/2008), page 64

The following additional property data should be added to existing purchase price records and transaction databases beside the already existing conventional building descriptions of type 1 and 2. This data should be made available to valuation professionals:

- *Sustainable Building Description* (No. 3 above): an assessment and classification of sustainability-related features in terms of a Sustainability Certification Systems such as LEED, BREEAM or DGNB (eco-assessment)<sup>90</sup>
- *Performance based Building Description* (No. 4 above): Measurement of direct impacts and effects resulting from the sustainability-related building characteristics (using economic sustainability indicator)<sup>91</sup>

To achieve a systematic description of major characteristics and attributes of buildings Lütendorf and Lorenz suggest establishing building passports or building files with performance-based building information which would be transferred in every property transaction between the parties involved.<sup>92</sup>

<sup>90</sup> see section 5.4.1 of this thesis.

<sup>91</sup> see section 5.4.2 of this thesis.

<sup>92</sup> see Lütendorf, T. and Lorenz, D. (2008), page 5.

---

#### 5.4.4 Reporting Requirements

The valuation results should express whether, which and how sustainability characteristics of a property have been considered risk reducing and value-influencing. The valuation professional should therefore explain and justify the underlying assumptions within the valuation report. Valuation reports should therefore be extended to cover the following aspects:

- Description of existing, sustainability-related features and - characteristics
- Valuer's comment in respect of the advantages of such features and characteristics for occupants and property owners and respectively in respect of risks, which may arise if such features and characteristics are lacking.
- Valuer's comment in respect of the effect of such benefits and risks on the respective property's Market Value (including description of valuation assumptions).

Additionally, valuers should advise clients of the sensitivity of property values to such effects and the potential impact of sustainability on tenant retention, terminal value and the possible depreciation and capital costs facing non-sustainable buildings.

#### 5.5 Conclusion

This chapter has demonstrated that sustainability is an influencing factor in the assessment of Market Value. It is therefore essential that sustainability is considered in the valuation methodology. The chapter has further investigated the nature of various economic real and tangible benefits resulting from sustainable features and concluded that it is theoretically possible to reflect these in traditional property valuation methods. The valuation profession has thus far been relatively slow to react to the changing market acceptance of sustainability due to the lack of comparable sales of buildings exhibiting sustainable features. As most sustainable buildings are new developments, the quantitative data on the buildings does not yet allow comparative assessment of the value deriving from sustainability. The economic benefits of sustainable features can however only be reflected in property valuation when higher purchase prices for sustainable buildings are recognised by the market and comparable data is available.

Furthermore this thesis provides an insight into some of the additional challenges faced by valuers when seeking to accurately identify the value of a sustainable building, ranging from the difficulty of quantifying the intangible sustainable aspects and the influence of individual sustainability features on property value to the lack of availability of reliable and freely available data.

In order to reflect sustainability characteristics in property valuations a higher level of market transparency is required. "This will remove much of the doubt and uncertainty surrounding sustainable commercial buildings and allow an assessment of value founded on a sound knowledge base and consideration of influencing trends"<sup>93</sup>.

---

<sup>93</sup> Reed, Richard (2007), page 20

---

## 6 Summary of Results and Outlook

In order to understand the impact of sustainability on property values it initially requires a profound understanding of the concept of sustainability and sustainability development. It was made clear that, considering the triple bottom line concept, sustainable properties have a variety of economic, social and environmental advantages. These include direct benefits such as operational cost savings, but also intangible benefits such as improved comfort and health of occupants.

Some empirical studies carried out internationally investigating the direct financial gains associated with sustainable features were reviewed. The majority of these studies concluded that minimal upfront costs are necessary to incorporate sustainable design resulting in life-cycle cost savings and increased rental and asset value, others indicated significant cost premiums attributable to the design and construction of sustainable buildings. While these studies provide tangible evidence of the value and cost of sustainable buildings, they are neither numerous enough for valuers to extrapolate general rules from nor are they, in the author's opinion, directly applicable to the German real estate market due to the higher building quality standards. For this reason a survey amongst German investors was conducted to identify whether a rental and sales premium is generally achievable for sustainable properties.

The results of the survey shows that, other than a general sentiment in favour of sustainable properties, market participant investors are primarily interested in the financial advantages of sustainable buildings, as investment criteria are paramount. Investors have still to be convinced by demonstration of the financial benefits of sustainable investments. According to the results of the survey investors and tenants are not yet willing to pay more for sustainable properties due to the unknown relationship between benefits and costs for sustainable assets. As tenants and property owners perceive the benefits of sustainable buildings, demand for them will rise. For investors it is important to demonstrate savings in the overall occupancy cost to the tenant over the lease period enabling higher net market rental income to be achieved. Acceptance of sustainability in the investment market thus requires further research into long-term savings for tenants and property owners.

Quantification of these advantages in monetary terms and evidence of the risk reduction potential is however not yet possible due to a lack of data. The novelty of sustainable buildings means that there is limited post-occupation data to confirm the findings over time. Delivering proof to owners that sustainability can have a positive impact on valuation and return to owners is one of the keys to accelerating the adoption of sustainability. There is a need for more research on the cost and benefit analysis, life-cycle costing for (different levels of) sustainability in buildings.

It has been shown that traditional valuation approaches are theoretically sufficient to reflect sustainable features in property valuation in Germany. A major obstacle hampering the integration of sustainability aspects into property valuation consists in a lack of sufficient property transaction evidence proving the link between the buildings' sustainable performance and observed property prices, as valuers rely on tangible evidence from sales and/or leasing from multiple properties. It is still too early to quantify the value impact for sustainable buildings. It is not clear which assumptions are being affected by sustainable initiatives. This situation will change naturally over time as experience of sustainable buildings improves and once market evidence becomes available.

---

The valuation profession needs to recognize this difficulty and develop an effective response by improving data availability for sustainable buildings. In this regard, the author recommends performing eco-assessments as part of the technical due diligence to assess a building's sustainable performance with the results being implemented into an economic sustainability indicator to establish a link between sustainability and its economic performance. This however requires a comparability of the different sustainability certificates (LEED, BREEAM and DGNB) and their criteria. The author further advises to improving the building descriptions by an assessment of the properties' sustainability characteristics and its performance in purchase price records and transaction databases, to better benchmark the property's performance against comparable sustainable buildings. Additionally the valuer should include a sustainability section in the valuation report.

It follows that the benefit of sustainable buildings should be recognised by the market and reflected in appraisal methodologies as the sustainable development culture becomes more widely adopted.