MRE MASTER THESIS MARTIJN VLASVELD

SUSTAINABLE RETAIL PERFORMANCE

Sustainability and the performance of a retail property investment portfolio

Amsterdam School of Real Estate

Author
Martijn Vlasveld
Master of Real Estate, 2010 - 2012
+ 31 6 18888 666
martijnvlasveld@gmail.com

Amsterdam School of Real Estate
Huys Azië
Jollemanhof 5
1019 GW Amsterdam

Supervisors

Hans Op 't Veld	Amsterdam School of Real Estate
Arthur Macquard	Amsterdam School of Real Estate
Hans Copier	CBRE Global Investors
Jaap Démoed	CBRE Global Investors

Abstract
This study focuses on the relation between sustainability and the financial performance of retail properties and aims to provide an advice on how outperformance can be created by integrating sustainability into the management of a retail property investment portfolio. In the data analysis, the financial performance and energy labels of 124 properties have been combined to ascertain any significant relations. An OLS regression analysis has then been performed to examine the origin of the differences and whether a sustainability premium exists. In the regression analysis, the results have been controlled extensively for type of center, center size, catchment area, property size, average m^2 per lease and age. The results from the historical analysis show that green properties have a significant higher income return and non-green properties have significant higher rents and values. However, this study indicates that the significant differences are not caused by the sustainability level of the retail properties, but by other factors influencing the performance. This means that sustainability has not had a significant effect on the investment performance of retail properties yet. However, the scenario analysis shows that non-sustainable properties have a higher risk of future underperformance and sustainable properties are positioned better to outperform.

Date
September 2012

Cover
Shopping center Beursplein in Rotterdam, the Netherlands, that has received a green energy label C and the first BREEAM in Use Retail certificate in the Netherlands

“Our biggest challenge in this new century is to take an idea that seems abstract

- sustainable development - and turn it into a reality”

Kofi Annan

Executive summary

Introduction

Although the benefits of investing in sustainability are quite evident for people and the planet, the impact on the 'profit' side of investing in sustainability is still largely unknown. This research is the first to focus on the effects of sustainability on the performance of a retail properties and complements the existing range of studies on the office and residential sectors. In addition, this study adds evidence from Dutch properties to the existing mainly American evidence. Furthermore, the potential 'measurement error' is reduced as this sample covers a total portfolio, not only the 'good' properties, and as many property attributes are well known.

In the first part of this study, the results from the literature review about the known effects of sustainability on the performance of properties are presented. The second part of this study focuses on the historical effect of sustainability on the financial performance. In the third part, several scenarios are analyzed, giving insight in the potential future effects of sustainability on the performance of retail properties.

The main research question is:

Is there a relation between sustainability and outperformance in a retail property investment portfolio?

The main research objectives are:

1) Obtain insight into the effects of sustainability on the investment performance of retail properties
2) Provide advice on how outperformance can be created by integrating sustainability in the portfolio management of a retail property investment portfolio

Literature review

Existing studies suggest that sustainable office and residential buildings have higher rents, higher occupation rates, lower operating costs and higher values. The nature of these effects vary considerably, depending on the size of the sample, the date of the transactions and the controls that have been put in place. In general, the more precise the controls are, the smaller the premium for green buildings is. No published articles are yet known that study the effects of sustainability on the retail sector and on property returns.

In the Netherlands, energy labels are the only sustainability indicators that are available on a large scale, since the Dutch government uses the energy label scheme to measure the energy efficiency of properties and to incentivize property owners to improve the sustainability level of their properties. As a result of that, energy labels are used to measure the sustainability level of retail properties in this research.

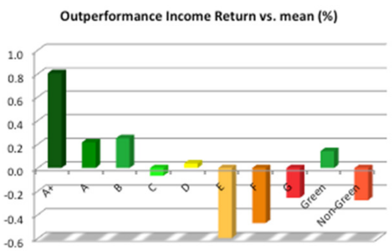
Data and methodology

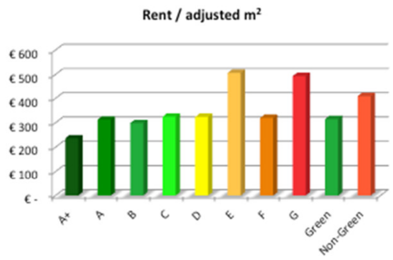
The relation between the sustainability level of properties and their performance is examined using a research sample of 124 properties from retail investment funds managed by CBRE Global Investors. This portfolio has a combined value of around € 2.0 billion, and this represents around 17% of the IPD Netherlands benchmark. The research sample comprises a mix of high street retail properties, shopping centers, neighborhood centers and peripheral large retail properties. All properties have been marked with an energy label and the number of energy labels in the sample comprises around 10% of all labels that have been issued in the Netherlands.

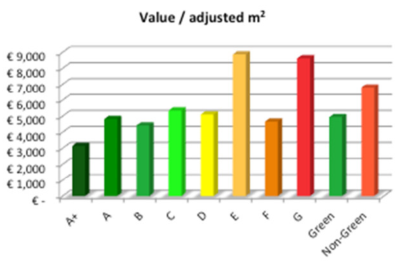
In the data analysis, the differences between the green and non green properties relating to the performance drivers and the control variables were first examined to see whether there are significant relations. Subsequently, an OLS regression analysis was performed in SPSS on the rents and values as of 31-12-2011 and on the total return, income return, vacancy rate and operating costs from 2007 to 2011, in order to examine the origin of the differences and whether a sustainability premium exists. The findings have been controlled for influences from the type of center, center size, catchment area, property size, unit size and age. Successively, a scenario analysis has been performed to examine the possible future effects.

Results

The results from the historical analysis show that green properties have a significant higher income return and non-green properties have significant higher rents and values, as is shown below:







Note: A+ = very energy efficient, G = very energy inefficient

However, when this is explored further by regression analysis, this study shows that the significant differences are not caused by the energy labels, but by other factors influencing the performance of a retail property. Contrary to the findings in the office sector, the total return, vacancy rate and operating costs did not have a significant relation to the sustainability level of a property:

Significant effect of the energy index on performance indicators	Total return '07-'11	Income return '07-'11	Rent per adjusted m^2	Value per adjusted m^2	Vacancy rate '07-'11	Operating costs '07-'11
Before regression analysis						
Significant difference	No	Yes***	Yes**	Yes**	No*	No
Correlation with energy index	-.15	-.39***	.28***	.29***	-.15	.03
After regression analysis						
Significant effect	No	No	No	No	No	No
Partial correlation with energy index	.00	.08	-.09	-.10	.01	.07

* Significant at the 10% level ** Significant at the 5% level *** Significant at the 1% level

Since the energy index is significantly positively related to the age and the size of the overall retail center, non-green properties are older and more prevalent in the larger centers. These larger centers also have higher rents and values and lower income returns. In addition, non-green properties are also smaller and have smaller retail units than green properties, thus enhancing the rent and values. Therefore, the significant differences in rent, value and income returns are not caused by the energy label, but by the center size, catchment area, location and size of the property. As a result, the main conclusion of the historical analysis is:

There is no evidence of a statistical relation between sustainability and outperformance of a retail portfolio

In order to create insight in possible future effects of sustainability on the performance of retail properties, several scenarios have been analyzed. The results are as follows:

IRR (10 years)	High street retail A	High street retail G	Shopping mall A	Shopping mall G	Neighbourhood center A	Neighbourhood center G	Peripheral large retail A	Peripheral large retail G
Base case (%)	6.64	6.64	7.11	7.11	7.80	7.80	8.30	8.30
Scenario 1: Effects as for offices and residences apply on retail								
Outperformance of green properties	2.96		3.02		3.00		2.93	
Scenario 2: Improving the energy label to a green label								
Outperformance of green properties	0.24		0.38		0.78		1.18	
Scenario 3 energy costs affect the rents								
Outperformance of green properties	0.31		0.42		0.80		1.16	
Scenario 4: A CO_2 tax is introduced								
Outperformance of green properties	0.36		0.36		0.36		0.37	
Scenario 5: sustainability is taken into account in selection decisions								
Outperformance of green properties	Depends on the vacany level, low impact when demand is high, high impact when demand is low							

In general, the effects of the scenarios for the retail sector are smaller than the findings from the office and residential sector. Furthermore, the performance of high street retail or a shopping center with is affected less in the scenarios than a neighborhood center or peripheral large retail property. In all scenarios the green properties outperform the non-green properties. Therefore, the conclusion for the possible future situation is:

Sustainable portfolios have the opportunity to outperform, not sustainable portfolios the risk to underperform

Since there is currently no price difference, this creates an opportunity for a portfolio manager to lower the risk of the portfolio and position the portfolio for potential future outperformance, without (many) extra costs.

Table of contents

Chapter 1: Research design

"Consumer demand increases for sustainable products" (FoodProductDesign, 2011)

"Australia taxes CO_2 emissions" translated from (Volkskrant, 2011)

"Green Buildings Make Cents" (Eichholtz, Kok, & Quigley, 2010)

1.1 Introduction

As the quotes above indicate, the interest in sustainability is rising. Large investors (like pension funds) focus more on social responsibility and are currently taking the lead in making real estate more sustainable (INREV, 2010). Also retailers do not only publish their financial performance, but disclose information on their performance regarding corporate responsibility and sustainability to their shareholders (H&M, 2012) (Inditex, 2012). Governments are trying to decrease the negative effects of climate change too (Volkskrant, 2011), and, in general, consumers are also becoming more interested in sustainable products (FoodProductDesign, 2011).

Sustainability is often described according to three key characteristics: people, planet and profit (Elkington, 1997). The essence is that anything as an idea, project or company is only sustainable in the long term if it is good for the people involved, the planet and is profitable.

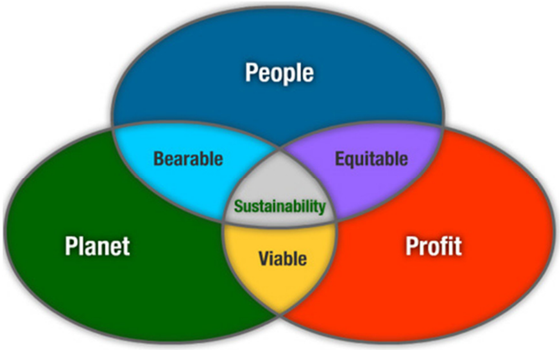


Figure 1.1: People, Planet, Profit. (Elkington, 1997)

Buildings have a large impact on these three items: they use a lot of energy and materials, determine to some extent the well being of the people that use them and the building sector comprises a substantial part of the economy. It is estimated that buildings are responsible for approximately 30% of the CO_2 emissions worldwide and 40% of global energy consumption (UNEP, 2009). The built environment also has a large potential to decrease CO_2 emissions (Enkvist, 2007). In addition, the real estate sector consumes a large amount of materials to construct and maintain buildings. Therefore, it is essential to include the real estate sector to decrease global CO_2 emissions and diminish the use of natural resources (UNEP, 2009).

Although the benefits of investing in sustainability are quite evident for people and the planet, the impact on the 'profit' side of investing in sustainability is still largely unknown. Several studies find that sustainable office and residential properties have higher rents and values (for example, Eichholtz, Kok & Quigley, 2010 and Kahn & Kok, 2012), but there is no research available on the effect of sustainability on the investment returns of properties. As the return is the investors' profit, the absence of this evidence makes it hard for investors to justify (large) investments to make their properties more sustainable (INREV, 2010).

In addition, all existing studies are on office and residential properties, mostly based on American data. There are no known studies on the retail sector. Since retail properties account for a large part of the investment universe and their investment return is determined by other factors than for offices and residential properties, it is important to know what the effects on retail properties are.

1.2 Subject of this research

This research will be the first to focus on the effects of sustainability on the performance of a retail property investment portfolio and will therefore complement the existing range of studies on rents and values for the office and residential sector. In addition, this study will focus on Dutch retail properties, complementing the existing American evidence with European evidence.

The first part of this study focuses on the historical effects of sustainability on the investment performance of properties. To make solid decisions on whether to invest in sustainability, historical evidence and insight into possible future developments is needed. Therefore, the second part of this study will focus on integrating historical results and possible future developments to provide advice on how the performance of a retail property portfolio can be influenced by investing in sustainability.

The main question research question is:

Is there a relation between sustainability and outperformance in a retail property investment portfolio?

This main question will be divided into the following sub questions:

1) What is the known effect of sustainability on the performance of investment properties? (Chapter 2)
2) Which factors drive (out)performance in a retail property investment portfolio? (Chapter 3)
3) Which data and methods are used to examine the historical performance of retail properties? (Chapter 4)
4) Is there a difference between the performance of sustainable and non sustainable properties? (Chapter 5)
5) Is the difference in historical performance caused by the sustainability level of the properties? (Chapter 6)
6) What are the possible future effects of sustainability on performance drivers? (Chapter 7)

Research goals:

1) Obtain insight into the effects of sustainability on the investment performance of retail properties
2) Provide advice on how outperformance can be created by integrating sustainability in the portfolio management of a retail property investment portfolio

Scientific relevance

This study explores the link between the sustainability level and investment performance within the retail sector for the first time. In addition, this research complements the existing studies on the American office and residential sector with data from Europe, where the available research data is much scarcer. In addition, data from an entire investment portfolio is used, not just the rated buildings from several portfolios. This diminishes the selection bias and increases reliability. Furthermore, all data on the returns and sustainability levels of the properties are provided by one source, ensuring data quality.

Social relevance

This research provides insight into the 'profit' aspects of investments in sustainability. With more insight into the 'profit' aspect, investments in sustainability can be evaluated and justified better. If specific investments in sustainability turn out to be profitable, more investments follow. If investments turn out not to be profitable, they are not sustainable at the longer term. Therefore, more insight into the profitability of investments in sustainability will ultimately lead to more sustainable investments in the future. In addition, portfolio managers will be better enabled to integrate sustainability in their investment programs. This is also valuable for developers, tenants, brokers and appraisers of retail properties.

1.3 Scope of this research

Retail properties

This research will focus on retail properties and not on other sectors. References to other sectors will only be used in the theoretical framework and for comparisons between sectors.

Figure 1.2: Delineation of the scope of this study for retail properties

Portfolio management

The main scope of this research concerns the effects of sustainability on a portfolio level.

This means that the focus will concern decisions on the acquisition and sales policy, management of the standing investments and the allocations of the portfolio within retail categories, such as different location or retail property types.

This research does not include the effect of sustainability on the fund performance, on which level the performance of the property portfolio is combined with the financing on the liability side of the balance sheet, since this belongs to the fund management level.

Decisions on whether an investment in sustainability is feasible on an asset level, or how to involve sustainability on a property level in maintenance decisions, for instance, will also not be covered by this research, since this is the domain of the asset
and property management.

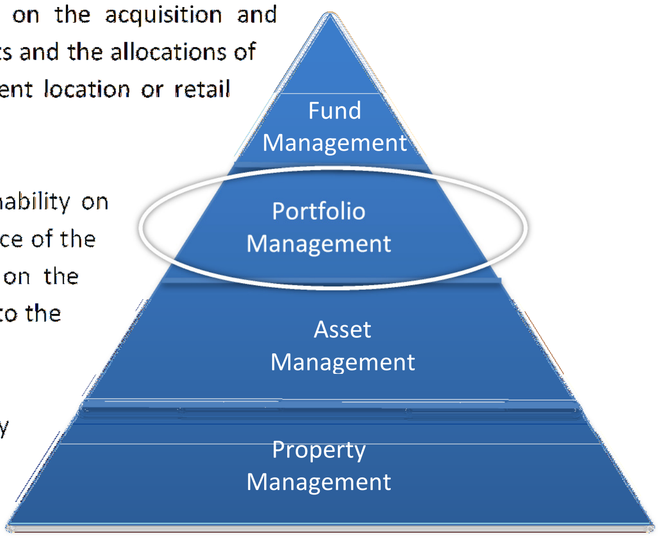


Figure 1.3: Management levels
Source: adjusted (Van Driel, 2003, p. 42)

1.4 Research layout and chapter summary

Chapter 2 focuses on the known effects of sustainability on elements that determine the investment return of properties. The ways to determine the sustainability level of retail properties are examined first. After that, the known effects of sustainability on property returns are examined by reviewing existing literature.

In Chapter 3, the performance drivers of retail property investments are examined by a literature review. These findings are used in later chapters to make the research results more robust by controlling the results for other factors that influence the return of a retail property portfolio and to distillate the effect of sustainability.

The use of data and the methodology are explained in Chapter 4. After that, Chapters 5 and 6 focus on the historical effects of sustainability on the performance of the retail properties. By combining the performance and the energy label of the properties, the link between sustainability and historical investment performance is explored.

Chapter 7 focuses on the possible future effects of sustainability on the portfolio return by analyzing the outcomes of several possible scenarios.

In Chapter 8, the conclusions regarding the effect of sustainability on the historical and expected performance of a retail property portfolio are discussed. Management advice for decision making on sustainability investments is also presented in addition to the results of the literature review and recommendations for further research.

Chapter 2: Literature review - the effect of sustainability on investment performance

This chapter shows the effects of sustainability on performance as documented in earlier studies. In paragraph 2.1, sustainability will be defined, and paragraph 2.2 will focus on ways to determine the sustainability level of properties. In paragraph 2.3, the available energy labels for this study are examined. Paragraph 2.4 will provide an overview of the evidence presented in earlier studies and, as a conclusion, paragraph 2.5 will answer the first sub question of this study:

- *What is the known effect of the sustainability level of properties on the investment performance?*

2.1 Defining sustainability

Already at the beginning of the 20th century, United States' President Theodore Roosevelt said the following on sustainability (Mackaaij, 2011) and combined the 'people' and 'planet' aspects:

"The nation behaves well if it treats the natural resources as assets which it must turn over to the next generation increased, not impaired, in value"

in the 1960s the number of publications on sustainability increased with books on the effect of population growth on the planet appearing, such as Carson's *Silent Spring* in 1962 and Ehrlich's *The Population Bomb* in 1968 (Atkisson, 1999). The focus in these years was more on the 'people' aspect. During the oil crisis and oil price hike in the 1970s, energy efficiency increased in importance and the attention shifted to the effects of humankind on the planet. In 1972, an influential report 'The Limits of Growth' was published by the Club of Rome (Meadows, 1972). In this report, a series of calculations were made to show the effect of human behavior on the Earth's systems. In 1972, the first United Nations Conference on the Human Environment was held in Stockholm, which led directly to the creation the UN Environment Program (UNEP). In 1987 the United Nations issued a very influential report about sustainable development, the Bruntland report. The definition of sustainability in the Bruntland report is one of the most widely used definitions and focuses on both the effects of future development on the 'people' and 'planet' aspects :

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (UN, 1987, p. 54)

Elkington (1997) takes this a step further and argues that developments or products also need to be profitable to be really sustainable. He defines sustainability very briefly as '*people, planet, profit'*. This paradigm has been used much in the corporate sector, with oil company Shell using it as the title for its first sustainability report in 1997, and many more companies followed this approach in their sustainability reports.

In line with the 'people, planet, profit' concept, the association of Dutch institutional real estate investors (IVBN) defined sustainable properties as follows (translated from IVBN (2009)):

"Real estate that is built and maintained in a way that it has a minimal impact on the scarce natural resources and functions optimally regarding health, interior climate, tenant satisfaction and value increase"

2.2 The sustainability level of property investments

After the Bruntland report, the focus of the UN and national governments has been more on the 'planet' and energy aspects of sustainability, mostly due to the effects of climate change. According to the UN Environment Programme (UNEP, 2009), a CO_2 reduction of 50% in the next 40 years and 25% until 2020 is necessary to avoid the worst-case scenarios of climate change. The United Nations (UNEP, 2009) estimates that the building sector emits circa 30% of global annual green house gas emissions and consumes up to 40% of all energy.

The Intergovernmental Panel on Climate Change (IPCC, 2007) claims that the CO_2 emissions of existing buildings can be decreased by 30-80% due to the long timespan of buildings. This is confirmed by Enkvist et al (2007), who conclude that investments in CO_2 emissions in the building sector pay themselves back by lower energy costs during the lifetime of the building. Based on these and other studies, the UNEP (2009) recommends that '*the mitigation of greenhouse gas emissions from buildings should be a cornerstone of every national climate change strategy'*. This is enforced by their three key conclusions:

- The building sector has the most potential for delivering significant and cost effective CO_2 reductions;
- Countries will not meet emission reduction targets without efficiency gains in the building sector;
- Proven policies, technologies and knowledge already exist to deliver deep cuts in CO_2 emissions.

In order to decrease CO_2 emissions, governments have set up energy labeling schemes. The US Environmental Protection Agency and the Department of Energy have set up the Energy Star program. In Europe, Energy Labels are a result of the European Performance on Buildings Directive (EPBD) from 2003.

- **US, Energy Star:** electrical appliances and buildings in the US can receive an Energy Star label when they belong to the top 25% of energy efficient buildings. The hurdle for this top 25% is determined every year by the American government.
- **Europe, Energy Labels:** the energy labels vary between A++ (very energy efficient) and G (very energy inefficient). The labels can only be issued by a certified company (regulated by the government).

Since sustainability covers more than energy alone, several other methods have been developed to measure voluntarily the sustainability level of properties. These rating methods and their categories are shown below.

Rating (%)	BREEAM	LEED	Green Star	GRESB	GPR Gebouw	GreenCalc+	Energy Star	Energy Label
Management	15	8	10	48				
Energy	25	25	20	37	20	65	100	100
Transport			10			8		
Health & Wellbeing	15	13	10	16	20			
Water	5	5	12	9	20	6		
Materials	10	19	10		20	21		
Landuse & Ecology	15	5	8					
Pollution	15	11	5		20			
Sustainable Sites		16						

Figure 2.1: Sustainability labels and their categories and weightings *Source: (BRE, 2008) (USGBC, 2012) (Herman De Groot, 2009)*

As can be seen in figure 2.1, the rating methods use a wide selection of sustainability characteristics and these criteria vary by label and weightings. Typically, sustainability labels focus on both 'planet' and 'people' aspects.

- **BREEAM** (Building Research Establishment Environmental Assessment Method) is used most in Europe and was the first sustainability label, developed in 1990 by the Building Research Establishment in the UK.
- **LEED** (Leadership in Energy and Environmental Design) was developed by the United States Green Building Council in 2000 and is used most in the US.
- Other major sustainability labels are **Green Star** in Australia, **Casbee** in Japan and **Green Mark** in Singapore. Most of these labels are based on BREEAM or LEED (BRE, 2008). An overview of the labels that are used worldwide can be found in Reed, Bilos, Wilkinson & Schulte (2009).
- In the Netherlands, several other sustainability labels exist, such as **GPR Gebouw** (mostly used by municipalities) and **Green Calc+** (less complex than BREEAM or LEED, focusing mostly on energy).
- **GRESB** (Global Real Estate Sustainability Benchmark) was founded by several large investors and benchmarks the sustainability level of several listed and non-listed funds.

Since the weightings and categories of the several sustainability labels differ, it is hard to compare them. In addition, the maximum levels of the sustainability labels are also not comparable. For instance, the highest LEED label (Platinum) is comparable to the highest Green Star label (Six Stars), but not to the highest BREEAM label. LEED Platinum is comparable to BREEAM 'Very good', and the higher BREEAM 'Excellent and Outstanding' labels can therefore not be compared to LEED and Green Star labels (BRE, 2008).

2.3 Selection of the most useful instrument to measure the sustainability level in this study

In order to select the most useful sustainability label for properties for the sample of Dutch retail properties, three aspects are important: first, the amount of labels that are available per type of label; second, the adoption of these labels by the government and by companies; third, the found effects of the types of labels on the performance of investment properties (as discussed in paragraph 2.5).

Availability of sustainability labels

In the Netherlands, almost 2,000,000 energy labels have been issued. Although most of these labels have been issued for residences, approximately 10,000 energy labels have been issued for commercial buildings, of which circa 1,900 are for retail properties (AgentschapNL, 2011). In 2011, the first five offices received their BREEAM in Use certificate, and the first retail property was labeled with BREEAM in June 2012. Only a handful of properties are labeled with LEED and the number of GPR and GreenCalc+ labels are unknown. Therefore, the energy label is the only sustainability label that is currently available in large amounts in the Netherlands.

In the US, almost 32,000 buildings have been rated with LEED as of April 2012 (USGBC, 2012). The commercial buildings and plants with an Energy Star labels are less: more than 17,000 (EPA, 2012). In Europe, BREEAM is very prevalent in the UK and has been used for the labeling of almost 200,000 buildings (BRE, 2011). Outside the UK, only 300 buildings have been certified. This allows researchers to study the effects of BREEAM and LEED labels in the UK and the US, but not in the Netherlands.

Adoption by the government and companies

The availability of energy labels in the Netherlands is also linked to government policy, where the sustainability focus is mostly on the energy aspect. For existing properties, the Dutch government has made the labeling of all properties mandatory. For newly built properties, the maximum EPC energy index (linked to the energy label) is an essential part of the building code and has decreased from 1.9 in 1999 to 1.1 in 2009. The aim is 0.0 (energy neutral) by 2020. Therefore, energy efficiency has had an impact on the characteristics of new built properties in the past, and, due to the future targets, this is expected to continue in the coming years. In addition, selling an existing property without an energy label is prohibited from 2013 and maximum rents in the regulated residential sector are also dependent on the energy label, including higher rents for greener properties and lower maximum rents for non-green properties. From 2013, commercial tenants can get a 10% rent discount if no energy label has been presented in the leasing or selling documentation. The Dutch government is allowed only to lease properties with a green energy label, or if the energy label will be improved by two steps. As a result, the energy label is already influencing office and residential rent levels. Since rents influence values of property, the value is also influenced by the energy label. Due to the government's focus on energy and the availability of energy labels, companies generally also focus on decreasing their energy reduction first and later concentrate on improving other sustainability characteristics.

In other industries, like automobile and household appliances, the government also uses the energy labels and the CO_2 emission as the basis for taxation. These CO_2 taxes are a combination of taxing high CO_2 emissions and tax exemptions for low CO_2 emissions, as UNEP (2009) recommends, since this is more effective than taxation alone. CO_2 taxes have not been introduced in the property sector yet by the Dutch government. A potential future CO_2 tax on properties is therefore likely to be based on CO_2 emission and energy labels.

Selection of the best available instrument to measure the sustainability level of a Dutch retail property

Since the government and companies currently focus primarily on decreasing their CO_2 footprint and decreasing their energy usage, many energy labels are available in the Netherlands. Therefore, the energy labels are both available and used by the government and companies. Although a label that covers more aspects of sustainability might be better, only very few properties have been labeled with a BREEAM or LEED label in the Netherlands. The next paragraph examines the effect of the labels on the property performance.

2.4 Effect of the sustainability level of properties on the financial performance

Several studies have been performed on the effects of sustainability and the performance of properties. In most studies on the effects of sustainability, the rent has been analyzed. Some studies have also examined the occupancy rates and the value of offices, although less evidence is available and less transactions take place. Many studies focus on American offices, based on data from the CoStar database. No studies regarding retail properties have been found. Figure 2.2 shows the results from these studies:

Existing studies to the performance of sustainable properties	Year	Data-base	Data From	Data from	Control buildings	Sample	Rent premium	Sales premium	Occupancy premium
Office sector									
Miller, Spivey & Florence	2008	CoStar	US	2003-2007	> 2000	643 Energy Star	8%	6%	2-4%
						(?) LEED		10%	2-4%
Fuerst & McAllister	2009	CoStar	US		10000	1291 Energy Star	6%	31%	3%
						292 LEED	6%	35%	8%
Fuerst & McAllister	2011	CoStar	US		15000	834 Energy Star	4%	26%	3%
						197 LEED	5%	25%	8%
Miller	2010	CoStar	US	2008-2010	378	12 Energy Star	-	-	-/- 4-5%
						5 LEED	12%	15%	
Wiley, Benefield & Johnson	2010	CoStar	US	2008	7308	Energy Star	7-9%		
					1151	LEED	16-18%		
Eichholtz, Kok & Quigley	2010	CoStar	US	2007	8105	Energy Star	3%	16-17%	
						LEED	5%	16-17%	
Eichholtz, Kok & Quigley	2011	CoStar	US	2009			2-7%	13%	3%
							6%	11%	3%
Reichhardt, Fuerst, Rottke & Zietz	2012	CoStar	US	2000-2010	7140	Energy Star	3%-7%		
						LEED	3-4%		
Chegut, Eichholtz & Kok	2011	CoStar	UK	2000-2009	1104	67 BREEAM	21%		
					1953	70 BREEAM		26%	
Van den Broek	2010		NL		148	50 Green energy labels	-	-	
Kok & Jennen	2011		NL		1100	Energy Labels	7%		
Residential sector									
Brounen & Kok	2011		NL		145325	31993 energy labels		4%	
Aroul & Hansz	2012		US		14922	7180 'green buildings'		2-4%	
Kok & Kahn	2012		US		1.6 million	4321 green labels		9%	
Property investment funds						**Return on**	**Fund**	**Assets**	
Makaaij	2011		EU			GRESB score	-	-	
Eichholtz, Kok & Yonder	2011		US		128 funds	Energy Star	-	1%	
						LEED	-	2%	

Figure 2.2: Results from earlier studies

Results from American office properties

One of the first articles about the effect of sustainability on American offices was by Miller, Spivey & Florance (2008). This study was one of the first, but not one of the most accurate. The rent difference is not controlled for the impact of other variables, while the sales price difference is controlled for age, size, CBD location, city and year of sale, but not for locations within the city. Since the sales price premium of 6-10% is only significant at the 85% level, the significance seems weak. The operating costs for Energy Star buildings are reported to be 30% lower than for non-Energy Star buildings. Since the regression analysis was only done on a marginal level, the location in the city and building quality aspects could also explain the effects.

In a comparable study, Fuerst & McAllister (2009) find a very high difference in sales price (31-35%) between green and non-green buildings. The results have been controlled for differences in age, size, height, building class and sub market, but not for occupancy rate. Since the median occupancy rate is only 63% for the control buildings, compared to 91% in the green buildings, this could also explain the differences.

Wiley, Benefield & Johnson (2010) have also used data from the CoStar database in 2008 and find a large rent premium of 7 to 17%, a value premium of up to 15% and an occupancy premium of 10 to 18%; all are significant. The figures are controlled for the city, lease type, age, size and date of sales. However, important controlling factors as the location within the city and building quality have not been taken into account. Furthermore, these results are based on a relatively small sample, with an unknown number of Energy Star and LEED buildings in a rent data sample of 7,308 properties and a sales data sample of 1,151 observations.

In their research ‘Doing Well by Doing Good’, Eichholtz, Kok and Quiqley (2010) perform a thorough analysis with CoStar data from 2007. In the regression analysis, they control for factors such as age, building size, building quality and location. The distinguishing feature of this research is the control for location: not in a city or submarket, but within a range of 0.2 square miles (700 x 700 meters). In addition, they control for the increase in employment in the service sector of the specific area and for the amenities nearby the offices. A 2.8% rent premium for offices with a LEED and Energy Star label results from the regression analysis, together with an effective rent premium of 7.9% (meaning that the vacancy is lower for green properties) and a value premium up to 16%. All three results are highly significant at the 1% level. This research shows that even after a thorough control, a sustainability premium for offices seems to exist. The remark that can be made to this research is that location quality differences can still exist within 0.2 square miles and that the building quality has been controlled on a Class ABC-level, while (large) differences can exist within those categories.

After that, a series of studies was published with data from later years and compared with their earlier data. With updated data from the CoStar database in 2010, Miller (2010) does not find a rent premium anymore for Energy Star buildings, and sales prices for Energy Star buildings are even lower than the sample buildings. Vacancy rates for LEED buildings are 4-5% higher, since most of them were delivered during the economic downturn resulting in a large supply of new LEED buildings. But again, the results are not so accurate. Miller has not controlled the results in a regression analysis and the research sample (5 LEED and ‘a dozen’ Energy Star buildings) is very small. The results are also colored by the fact that a large proportion of the LEED buildings (40%) are occupied a single tenant and the median LEED occupancy rate is 99%. Only 10% of the Energy Star buildings are single tenant buildings and their median occupancy rate is 95%.

In their study ‘Green Noise or Green Value’, Fuerst & McAllister (2011) have a more focused data set, examining 834 Energy Star and 197 LEED buildings, as well as over 15,000 benchmark buildings. The value premium that they find is again very high (25-26%) and the average occupancy rate premium (28%) of the green over the non-green properties remains high. This could still explain the difference in rent and sales price.

Eichholtz et al (2011) compare new results from 2009, during the financial crisis, with their earlier study comprising data from 2007, before the financial crisis. Their conclusion is that the economic premium to green building has decreased slightly, but rents are still significantly higher than for non-green properties. What is new is that the rent premium depends on the level of the LEED rating: a higher effective rent emerged at a score of 44 (LEED Silver) and was maximal at the score of 75 (Gold). The rent premium is around 2% for Energy Star buildings and 6% for LEED buildings. The effective rent premium is 6% for both LEED and Energy Star buildings and there is a sales premium of 13% for Energy Star and 11% for LEED buildings: all strongly significant at the 1% level.

A time-varying overview of the rent premium of American offices with an Energy Star and LEED labels between 2000 and 2010 is made by Reichhadt, Fuerst, Rottke & Zietz (2012). They find that the rent premium for Energy Star buildings was highest in 2005 with 7.0% and that this declined to 2.9% in 2009. For LEED buildings, the rental premium was 2.9% in 2006 and this rose to 3.9% in 2009. The results were controlled for age, size, unemployment and vacancy rate of the region. To control for location, control properties are sought on a broad submarket level (291 submarkets), and the building quality is based only on the ABC classification.

All these studies on the American office market indicate a rent and/or value premium for green office properties. However, the more precise the controlling criteria are, the smaller the rent premium is. The building quality of green buildings is also higher than for non-green buildings but it is difficult to control for location. For instance, Eichholtz et al (2011) indicate that the sample of rated buildings comprise 75% Class A buildings, while the sample of control buildings only has 26% Class A buildings. Furthermore, the rated buildings have more favorable characteristics regarding age, size, location, transport and amenities. This is not surprising, since often only the best buildings are being offered for a (LEED or Energy Star) rating.

Studies on European office properties

Two of the first academic studies on the European office market were master theses from the Amsterdam School of Real Estate. Pot (2009) finds in a very small sample of 18 'green' offices compared to 63 'non-green' Dutch offices a higher rent and value for green properties, but after controlling for location, size and age in a regression analysis, she no longer found a significant rent or value premium for green offices. However, this result can also be explained by the very small sample.

Van den Broek (2010) has done a comparable research with a somewhat larger dataset of 50 green and 98 non-green Dutch office properties. She also did not find a significant relation between the rent and value of the building and the energy label, contrary to the results of the published studies, although the rent was higher for the properties with a green energy label (but insignificant). This is also the first known study that investigates the relation between office investment returns and energy labels. She finds that there is no significant relation between the energy label and the property return. The results have been controlled for size, age, type of location, building quality, train station proximity and city, but not for locations within the city. Since the location within a city has a large influence on the rent and return, it is plausible that no significant relation has been found. A study with smaller areas could provide more insightful results.

Some non-academic studies on the Dutch office market find the same results as for the American office market. According to a study by Troostwijk (2011), offices with a "yellow" energy label D have a rent discount of 25% compared to "green' A label properties, and buildings with an F label have a rent discount of almost 40%. DTZ Zadelhoff (2010) finds that in a sample of 150 Dutch offices, energy labels are 'positively correlated' with property value. These results were not controlled for location, age or size, although the average age of A labeled properties is 8 years, compared to 28 years for 'non-green' properties.

Jennen and Kok (2011) made a more thorough analysis and compared 1,100 rent transactions of Dutch office properties with their energy labels and controlled the transactions for location (based on the four digit zip code), age and size. New aspects in the research included the distance to the nearest train station and highway ramp and the 'walk score', being the distance to a varied set of neighborhood amenities. The rent levels were controlled by year: the highest rent premium of 6.5% for green properties was in 2010, in which year the rentals for "non-green" declined fast and the rentals for "green" buildings rose fast.

The first study to look at the connection between BREEAM rated buildings in the UK and property performance was by Chegut, Eichholtz and Kok (2011). The sample is relatively small and the observed premium is high (a 21% higher rent and 26% higher value), after controlling for rental unit size, age, storage, amenities and renovation, but there is no control for building quality, such as building class or material quality. The location controls were done on ZIP code level and by distance to a public transportation station. Furthermore, the sales prices were checked by investor type, and it is interesting that 19% of the premium can be accounted for by institutional investors. In addition, the rent premium of sustainable offices decreases if more sustainable buildings are present nearby. Since there are only relatively few office properties labeled with BREEAM, a 'sample bias' may exist because often the best buildings are the ones that are labeled first.

Summarizing, the results from the European studies on the effect of sustainability on the rents, values and returns provide a mixed view. This could be caused by the relatively small sample sizes. The only study that has a reasonable sample size (Jennen & Kok, 2011) results in a rent premium for Dutch offices.

Results from residential properties

Research by Brounen & Kok (2011) shows that in a large research sample with 31.993 residences, dwellings that are "green" have on average a 3.7% higher sales prices – everything else being equal - than "non-green" dwellings. The result of their study is that residences with an A label have an average sales price premium of 15% over residences with a G label. The results have been controlled for type, month of sale, province and age.

Aroul & Hansz (2012) have made an analysis of the sales prices of residential properties in Texas (US) that were built in a mandatory green building program. They find that these residences have a sales price premium of 2% over the control group of residences that were built in the green building program for a larger sample of 6,476 green transactions and of around 4% for a smaller sample. The results have been controlled for age, size, location, city and a large number of residential building characteristics. Since all the green properties were built in two new areas, they had to be compared to non-green properties in other areas. Although the location was a control variable, it is still unclear whether the premium was because of the green label or due to the characteristics of the dwellings or the specific location of the new area.

A very large study has been performed by Kahn & Kok (2012) analyzing 1.6 million housing transactions between 2007 and 2012, of which 4,231 had a green label. After extensive controlling in a regression analysis, a sales premium for the green properties of 8.7% results. Since 70% of the green dwellings were constructed during the past five years, a robustness check was performed with properties of the same age, which results in a premium of up to 11.2% for residences with an Energy Star rating (at the 1% significance level).

Summarizing, the results of the three studies above indicate a price premium for green residential properties that even hold up in a large sample and in rigorous regression analysis.

Results on fund level

Studies on the relation between the financial performance of investment funds and their sustainability level have been done for a long time and result in many positive, negative and insignificant findings. Large review articles find also mixed views. For instance, Griffin & Mahon (1997) and Margolis & Walsh (2001) conclude that there is no clear direction in the evidence, while Orlitzky et al (2003) conclude in meta-analysis of 52 studies that there is a (small) positive relation between the sustainability level of a fund and the financial performance. For property investment funds, there are no known published studies. So far, only one master thesis from Groningen University and one research paper about this topic are known (see below).

Mackaaij (2011) has made an analysis of the performance of listed real estate funds and their score in the GRESB research. In his research, he does not find a significant relation between the Sharpe ratio of the funds and the GRESB score, meaning that the funds' risk-adjusted returns on the period 1998-2010 are not significantly higher for funds with a higher GRESB sustainability score in 2009. In his multiple regression analysis, he finds that the correlation between the Sharpe ratio and the GRESB score is slightly positive, although not significant at the 5% level. However, the period of the financial performance in this research (1998-2010) is quite long and it is unclear whether the GRESB sustainability score of 2009 was representative for the sustainability level of the fund during the whole period of the financial analysis.

In 2011, Eichholtz, Kok & Yonder examined 128 REITs for the relation between the performance of an investment fund and the percentage of green assets in their portfolio. They did not find a higher fund return for funds with a greener portfolio. On a portfolio level, they do find that when the percentage of green properties increases by 1%, the Return on Assets increases by 0.5% for Energy Star and 2% for LEED properties. Furthermore, the risk level (beta) of the portfolio decreases by 6-7% if the share of LEED buildings increases by 1% and by 0.7% to 1.0% for 1% more Energy Star buildings (compared to an average beta of 1.00).

Summarizing, the effect of sustainability on the performance of investment funds is unclear, and there is also not a clear relation between the sustainability level of the properties and the fund performance. On a portfolio level, a more sustainable portfolio seems to lead to a higher Return on Assets and a lower risk profile.

2.5 Conclusion

The studies on American office properties conclude unanimously that sustainable office properties have a significantly higher rent (they all also use the CoStar database). This positive effect is even stronger for the values of sustainable American office properties. A negative relation exists between the vacancy rate and operating costs with the sustainability level, resulting in lower vacancy rates and lower operating costs for sustainable American office properties.

Fewer studies exist on the European office sector and the results of these studies are mixed. The early studies on the Dutch office market with relatively small samples show no significant relation between the level of sustainability and the rent or values. However, a larger study combining energy labels and Dutch office rents concludes that sustainable Dutch offices do have higher rents, and a well-designed constructed study on the relation between the BREEAM labels and British office rents and values confirms this view.

In the residential sector, the results of the three studies on the relation between sustainability and the transaction prices of dwellings in California, Texas and the Netherlands all show that sustainable residential properties have significantly higher values than properties without a (green) sustainability label.

The results from studies on the relation between the performance of investment funds and their sustainability scores are mixed. There is already a long running discussion on whether sustainable investment funds in general have a higher return, and evidence about positive, negative and nonsignificant relations all exists. For property investment funds, no significant return premium on a fund level has been found. However, a higher return on the assets in the fund and a lower risk profile for sustainable funds has been discovered.

Most studies use age, size, location and building quality to control for the influences of other factors. In general, the more precise the controls are, the smaller the premium for green buildings is. Although the results and effects are significant, these results could be biased, since buildings with a sustainability label are on average newer, larger and of higher quality. Also, after a control for these factors has been made, other elements concerning higher building quality could still be visible in the financial characteristics of the building.

For the retail sector, there are no known studies as yet. Therefore, this research will add value to the current portfolio of studies by examining both the retail sector and the return effects. Based on the results from the literature review for sustainable office and residential properties, the following effects can be expected:

Dependent variable	**Expected relation to sustainable properties**	
Rent	Positive	Sustainable retail properties are expected to have a higher rent
Value	Positive	Sustainable retail properties are expected to have a higher value
Vacancy level	Negative	Sustainable retail properties are expected to have a lower vacancy rate
Operating costs	Negative	Sustainable retail properties are expected to have lower operating costs
Investment return	Unknown	No prediction of the effect of sustainbility on the returns can be made

Figure 2.3: Expected effects based on the literature review

To measure the sustainability level of retail properties, many different sustainability labels have been developed around the world. For Dutch properties, various energy labels are available and mandatory from 2013. Only a few sustainability labels (mainly BREEAM) have been made. Furthermore, the Dutch government uses the energy label scheme in its policies to decrease CO_2 emissions. As a result, energy labels are the best available instrument to measure the level sustainability in this study.

Chapter 3: Building the model - performance drivers in a retail property portfolio

In order to assess the relation between sustainability and the (out)performance of retail properties, it is important to know 1) how outperformance is calculated, 2) what the main (out)performance drivers of retail property investment returns are and 3) which other factors influence the performance of retail properties, so that the model can control for the effect of these variables.

How outperformance is calculated is addressed in paragraph 3.1. Subsequently, the main drivers of investment performance are addressed in paragraph 3.2. The most important control variables that also influence the performance are provided in paragraph 3.3. In paragraph 3.4, the answer to this chapter's research question (sub question 3) is provided:

> *Which factors drive (out)performance in a retail property investment portfolio*?

3.1 Outperformance

Outperformance can be defined as '*performing better than the benchmark'*. According to Theebe (ASRE, 2012) and (INREV, 2010), there are three types of benchmarks:

- an absolute benchmark: a fixed percentage;
- a relative benchmark: the performance compared to an index such as the IPD, NCREIF or NAREIT;
- a hybrid benchmark: a relative benchmark plus an absolute additional return, such as EURIBOR + X%.

According to the INREV (2010), 67% of the non-listed real estate investment funds use a relative benchmark, of which the INREV index and the IPD index are the most popular. The INREV and IPD index are both based on the average of all the funds and properties that participate in these indices. In this way, outperformance can also be defined as 'performing better than the average'.

3.2 The factors influencing property investment returns

The property investment returns are determined by the following factors:

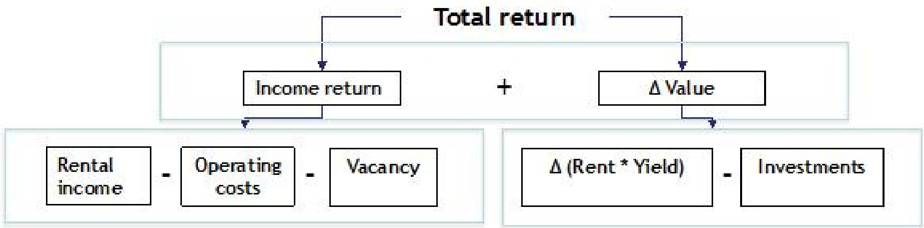


Figure 3.1: determinants of property investment returns *Source: Adjusted from Geltner & Miller (2007)*

The total return comprises the income return and the value change. The income return of a property comprises the total (theoretical) rental income, minus all exploitations costs (including leverage) and the vacancy that exists in the property. The value of a building is determined by the rent and the investment yield or discount rate. The net effect of a value change on the return is calculated by the change in value minus the investments in the same time period.

The rents, vacancy levels, operating costs, values and yields vary per property. These factors will be explored further in the next paragraph. It is important to control the observed research results for the influences of these variables. Therefore, these variables are called 'control variables'.

3.3 The factors influencing retail property investment returns

General retail theories

As offices are located in places where the highest productivity can be achieved at the lowest costs, the location of a retail property also determines the amount of income that a retailer can achieve and as a result, the rent that he can pay. Therefore, the factors influencing property returns of retail properties differ significantly from office properties. Several theories have been developed to explain why locations are (not) successful and what determines the rent and value of a location.

Christaller developed in 1933 a leading theory on why customers purchase certain goods at a certain place (Atzema, 2009). In his theory, the hierarchy of centers and the size of the catchment area are paramount. For daily goods, customers are not willing to travel far, resulting in a relatively small catchment area. For goods that customers do not often purchase, customers are willing to travel further and a larger catchment area of customers is needed to reach the same turnover. In this way, Christaller created a hierarchy of centers, with high order centers comprising a large number of stores selling specialized products to a (very) large catchment area and low order centers with a small number of stores, selling custom daily goods. Reilly confirmed this in his theory (Bolt, 2003), stating that the attractiveness of a city center is proportional to its size and inversely proportional to the distance that needs to be traveled. A city center that increases in size, lowers the turnover for neighboring smaller centers.

Hotelling, Nelson and Myrdal formed theories explaining why retail property centers are formed. Hotelling made clear that if there are two competing retailers in a catchment area, both will try to serve the largest part of the catchment area. In the end, they will both locate at the center of the catchment area, since they can both serve the largest catchment area at that location. According to Myrdal's theory from 1957 (Atzema, 2009), retailers also want to be close to other (successful) retailers, especially the smaller retailers who want to cluster next to the larger retailers that function as a magnet for customers. In this way, smaller retailers profit from the customers who are attracted by the anchor stores. Nelson explains the clustering of retailers selling comparable non-daily goods – such as fashion- by the desire of customers to be different and to compare goods before they purchase (Bolt, 2003). Therefore, the center with the largest number of retailers selling comparable goods will attract the most customers.

The rents and values are also based on the location, according to Alonso's theory from 1954 (Bolt, 2003). Most retailers want to locate in the larger centers near the anchor retailers, where the number of consumers is the highest. Since there are only limited places near the anchor stores, property rents near the anchors will rise and will drive out retailers with a lower profit margin, who cannot operate profitably anymore, to locations with less consumers and to smaller centers. Therefore, the rents will be highest at the best locations in the largest centers and lower at less attractive locations in smaller centers. Not only will the rents be highest in places with the largest customer flows, but the real estate prices will be highest too. Since more retailers want to be at better locations, the vacancy risk is lower. Therefore, investors are willing to pay a higher price and a lower yield for properties at better locations.

According to these retail theories, the performance of a retail unit is based on its place in the hierarchy of centers, the size of the center, the catchment are of the center and the location within the center.

Rents

In the literature, many studies have been done to confirm the general theories and to explain the retail rents in more detail. Several categorizations of influencing factors have been made. In a large review article, Meija & Benjamin (2002) categorizes the influencing factors into five segments: *market, site and building* and the non-spatial factors *tenant mix and image*. In a somewhat different structure, these factors are also the basis of the categorization in the influential work of Bolt (2003) and a study by Speentjes & Van der Steen (1998). Therefore, Meija & Benjamin's (2002) categorization will be used.

Market and catchment area
Christaller's theory stipulates that the amount of inhabitants in a catchment area determines to a large extent consumer sales and rents, and this is confirmed by several studies (Mejia & Benjamin, 2002) (Liu, 1970) (Ingene & Lusch, 1980). The average income of the population in the catchment area is also positively related to the retail sales and rent (Liu, 1970) (Ingene & Yu, 1981) (Mejia & Eppli, 2003) (Hardin & Wolverton, 2000, 2001). The retail sales and rents also depend on the percentage of consumer spending that is spent inside the center's catchment area; if consumers travel to larger centers outside the catchment area, the retail sales in smaller centers is affected (Mejia & Benjamin, 2002) (Russell, 1957) (Lillis & Hawkins, 1974) (Anderson, 1985). Furthermore, demographic factors also influence retail sales. Research by Eurostat (2009) indicates that the highest spending is by people between ages 30 and 60 and that people aged below 30 and above 60 have the lowest spending. Liu (1970) shows that the proportion of inhabitants with college education is positively related to retail sales.

Alonso's theory that states rents will be higher in larger centers is conformed in several studies all over the world: in the USA by Sirmans & Guidry (1993) and Hardin & Wolverton (2000) (2001), in Hong Kong by Tay, Lau & Leung (1999), in Canada by Des Rosiers, Theriault, & Menetrier (2005) and in the Netherlands by Koot (2006). Eppli & Shilling (1996) find that if the distance to the nearest competing center is longer, the rents in these competing centers are higher and the larger the center, the higher the rents, confirming Reilly's theory. Hardin & Wolverton (2001) find that if multiple shopping areas locate very close to each other (< 1mile), the shopping areas connect and create larger centers with higher rents as a result.

Site location
The two most important aspects of site location that affect retail rents are accessibility and visibility (Mejia & Benjamin, 2002). The amount of parking spaces is positively related to shopping center rents (Ownbey, Davis, & Sundel, 1994). For Dutch neighborhood centers, Koot (2007) finds that bad parking facilities result in a 24% lower rent. The presence of a metro station also has a positive effect on shopping center rents (Tay, Lau, & Leung, 1999). The visibility of the center is also very important, although it is difficult to measure. Ownbey, Davis, & Sundel (1994) find that the larger percentage of units that are visible from the outside, the higher the rents. For a diverse portfolio, including city center high street retail properties and shopping centers, parking spaces are often spread around the city center and not always directly linked to centers comprising high street retail units. Therefore, the amount of parking spaces is difficult to measure in a mixed portfolio.

The building
The three main aspects that influence the sales and rents of a specific shopping center building are the average size of the retail unit the age and the design of the center (Mejia & Benjamin, 2002) (Koot, 2007).

The average size of the unit is inversely related to the rent. This is in line with the theory of Myrdal, who states that the anchor tenants such as (large) department stores draw the customers and that smaller retailers without own drawing power are prepared to pay higher rents to locate near the anchor stores. This theory is confirmed by results in several countries: Eppli & Shilling (1995) find this in multiple countries, Tay, Lau & Leung (1999) in Hong Kong and in Canada the effect is found by Des Rosiers, Theriault & Menetrier (2005).

The age of a shopping center also influences the average rent. For American shopping centers, Sirmans & Guidry (1993) and Gatzlaff, Sirmans, & Diskin (1994) find that a higher age leads to lower rents. This is confirmed in a large study by Mejia & Eppli (2003). The effect of ageing is strongest in the beginning and diminishes as a center gets older (Hardin & Wolverton, 2001). On the other hand, Tay, Lau, & Leung (1999) find that old shopping centers can have higher rents than younger ones, due to fact that the older centers have more prestige than the newer ones. Also, in the Netherlands, the effect of aging can be seen and the renovation of a center can lead to higher rents (Bolt, 2003).

The design of a shopping center also influences its sales and rents. In research by Sirmans & Guidry (1993), 55 American shopping centers were divided into several design categories and it turned out that the ones with a 'covered mall' and 'cluster' design had a higher rent than shopping centers with a L-, U- and linear design. Other studies on shopping center designs find that one category has higher rents than the other, but the designs are difficult to compare and results are often not significant. Therefore, this factor is too specific to include in a model at portfolio management level.

Image and tenant mix

On a non-spatial level, rents are determined by image and retail mix. The image of shopping centers is for a large part determined by the image of the anchor tenants (Eppli, 1998), image of the non-anchor tenants (Mejia & Eppli, 2003), the location (Finn & Louviere, 1996) and quality, service and convenience (Mejia & Benjamin, 2002). For larger centers, a focus on specific branches (such as fashion) leads to a higher rent (Des Rosiers, Theriault, & Lavoie, 2009). A good mix comprising large and small retailers and a focus on higher quality department stores lead to higher rents (Mejia & Eppli,1999, 2003). For neighborhood shopping centers, proximity and convenience counts, and a wide tenant mix leads to a higher rent (Mejia & Eppli, 2003). Furthermore, the type and brand of an anchor store (such as the brand of a supermarket) also influences the retail sales of non-anchor stores (Hardin & Wolverton, 2001). Since the image of the anchor tenant and the tenant mix is too asset specific, this variable is not included in the portfolio level model.

Inclusion in the model

Retail rents are determined mainly by the size and hierarchy of the center, the catchment area, the location of the property, the property size, the age and the average retail unit size. Other factors also influence retail rents, such as accessibility and visibility, building design, image of the anchor tenants and tenant mix, but these aspects are difficult to measure and relations are not always significant .

Vacancy

According to various retail theories, the vacancy level of a location is largely dependent on the hierarchy level of a center (Christaller and Reilly), the presence of anchor tenants and comparable retailers (Nelson and Myrdal) and on the exact location of a retail unit within the center (Alonso). This is also confirmed by empirical findings from Locatus (2012): vacancies in city centers (the highest level of the hierarchy) are the lowest of all the centers. Furthermore, the vacancies at Dutch A1 locations are now at their lowest levels compared to past years, even in a time of economic downturn (Zandbergen, 2012). The vacancy level is the highest at C-locations and at peripheral large retail locations (Locatus, 2012).

Operating costs

The operating costs of retail properties comprises mainly of expenses for normal maintenance, management, taxes, insurance and marketing. Almost all of the costs are related to the size, value or rental income (which are all interlinked). On average, operational costs are around 8-15% of the rent (IPD, 2011). In general, high street retail units have the lowest operating costs (around 8%) and covered shopping centers have the highest operating costs (around 12-15%). With an average yield of 6-7% for retail properties, the effect of operating costs on the return of retail properties is less than 1% and is fairly constant over time.

Values and yields

The value of a property is generally determined by the Discounted Cashflow (DCF) method or the capitalization method (Brown & Matysiak, 2000). Using the DCF-method, future cashflows (the rent minus vacancy and operating costs) are discounted to the present value at a discount rate. Using the capitalization method, the income of the property is divided by the required or passing yield that the property needs to generate. In both calculation methods, three factors are important: the (net) income, the growth rate of the net income and the required yield or discount rate.

The actual yield is the yield in a transaction and is calculated by the theoretical market rent divided by the sales price corrected for vacancy and property specific variables (ASRE, 2011). Since this yield is mostly used in valuations and too detailed on a portfolio level, the change in actual yield will not be used in this study.

The required yield discount rate is built up from the following components (Baum, 2009):

- The risk-free return;
- The country risk premium;
- The risk premium for real estate risk in general;
- The risk premium for the retail segment;
- A risk premium for specific property risks.

The risk premium for the retail properties and the risk premium for the risk of a specific retail property are determined on three levels and by the same factors that influence the rent levels (Van Wetten, 1996)(Bolt, 2003):

1) macro level: the wider environment surrounding the property and the characteristics of the catchment area;
2) meso level: the location of the property, together with accessibility and visibility;
3) micro level: the design of the building, the tenants, the potential to add value and property risks.

As a result, the properties at locations with high numbers of visitors and high turnovers that are favored by many retailers are also the properties that are favored by the largest number of investors. In addition, a large proportion of the real estate investment risk is the vacancy risk. Therefore, the properties in the largest centers and at the best (A) locations have the lowest risk and yields. In smaller centers and less prominent (B and C) locations, the yields rise (Bolt, 2003) in line with Alonso's theory.

Capital expenditures

Capital expenditures can be costs that are necessary to upgrade a property to a certain level or to realize a higher rent. If those capital expenditures are necessary or feasible, they have to be subtracted from the total building value. These capital expenditures are very specific to a property or investment and are therefore not included in the research model.

3.4 Conclusions

The performance of a retail property is determined by the following variables:

Performance driver	Relation to the performance of retail properties
Total return	Key performance driver
Income return	Influences the total return directly
Value change	Influences the total return directly
Rent	Influence thes income return and value change
Operating costs	Influences the income return
Vacancy level	Influences the income return

Figure 3.2 Performance drivers of retail properties

The following variables were found in the literature review to have a significant relation to the performance and can be measured at portfolio level:

Control variable	Expected relation to the performance of retail properties	
Center hierarchy	Positive	The higher the center in the hierarchy, the higher the rents and values
Size of the center	Positive	The larger the center, the higher the rents and values
Catchment area	Positive	The larger the catchment area, the higher the rents and values
Location in the retail area	Positive	The better the location of a retail unit, the higher the rents and values and the lower the vacancy
Size of the property	Negative	The larger the property, the lower the rent
Size of the retail unit	Negative	The larger the retail unit, the lower the rent
Age	Negative	The older a retail property, the lower the rents and values

Figure 3.3 Control variables for the retail property performance

These variables will be used to strengthen the research results by accounting for the influences of other variables that also impact the performance of a retail property. The major control variables from the existing studies (see Chapter 2) are also in this list and have therefore been included in the model.

Chapter 4: Data and methodology

This chapter focuses on the research data and methodology. In paragraph 4.1, an overview of the data sources is provided and the representativeness will be examined by comparing the research sample with sector-wide data sources. Paragraph 4.2 focuses on the research method that will be used in the analysis, leading to the results in Chapter 5 and 6. Paragraph 4.3 addresses the limitations of the data. In the concluding paragraph 4.4, the research sub-question for this chapter is answered:

Which data and methods are used to examine the historical performance of retail properties?

4.1 Data

The research sample comprises 124 retail properties from 4 retail investment funds: the CBRE Direct Dutch Retail Fund, the CBRE Indirect Dutch Retail Fund, the RFM Woning-Winkelfonds III CV and the RFM Woning-Winkelfonds V CV, all managed by CBRE Global Investors. CBRE Global Investors is the largest real estate investment manager worldwide and one of the largest real estate investment managers in the Netherlands.

As the first large investor in the Netherlands, CBRE Global Investors has labeled all its retail properties with an energy label. In total, 1,900 energy labels have been assigned to retail properties as of 2011 *(AgentschapNL, 2011)*. Almost 10% of these labels (189 labels) are included in this study. Since some properties exist of multiple parts, they have received a separate label for each part and an consolidated label has been calculated for the property based on the sizes of the specific parts of the property. The consolidation of the 189 labels for the parts leads to 124 labels on a property level.

Data sources

The general information of the 124 properties (address, property type, type of center, age, size, number of leases) originates from the property characteristics database of CBRE Global Investors. The rents have also been extracted from the CBRE Global Investors database and are the actual rents as of 31-12-2011. The information about the catchment area and the size of the overall center originate from the Locatus database. Locatus is a Dutch research firm that has a database of all the retail properties in the Netherlands and contains information about the location, size, tenant, retail type and the catchment area of each specific property.

Ideally, the data on the values would be subtracted from a database of transaction prices, but such a database with energy labels is not available for Dutch properties. As a proxy, the property values have been derived from the valuations made by external appraisers DTZ Zadelhoff, HB Kroese Paternotte, Jones Lang LaSalle and Cushman & Wakefield. Every property is valued quarterly by two independent appraisers, who together appraise one joint value for the property. The values are all as of 31-12-2011. The property valuations are in a close range to the actual sales price. This is illustrated by the sales in the period between 2009 and 2011, in which 91 retail properties were sold with an average sales price of 1.4% above the valuation. 95% of the actual sales prices were between 0.4% and 2.4% above the valuation. These sold properties have not been included in the sample, since most of them did not have an energy label and data over the full research period from 2007 to 2011 was not available for these properties (as they were sold).

All performance characteristics (total return, income return, operating costs and vacancy rates) for the 112 properties from the CBRE Dutch Direct and Indirect Retail Funds have been extracted from the Investment Property Databank (IPD) database. With more than 25 indices on country and continent level, the IPD names itself as '*the global leader in real estate performance analysis*' (IPD, 2012). IPD uses the same method for all properties to calculate the performance characteristics, ensuring consistency. The property returns for the 12 properties from the RFM Woning-Winkelfonds III and V CV's are not calculated by the IPD, since they are not in the IPD benchmark, but have been calculated using the same IPD method.

The energy labels have been issued by external consultants Search and Innax. These two companies are the market leaders in issuing energy labels in the Netherlands. Both companies are certified to issue the energy labels by independent certifiers, who are supervised by the Dutch government. The energy labels were issued in 2010 and refined in 2011. Therefore, all energy labels are dated on 31-12-2011.

The representativeness of the research sample data distribution over retail property categories

The combined value of the properties is € 1.95 billion and represents around 17% of the IPD Netherlands Retail benchmark. This benchmark covers around 60% of all institutionally owned retail properties. Therefore, the sample represents around 10% of all institutionally owned retail properties in the Netherlands. Compared to the segmentation of all properties in the IPD Netherlands retail property benchmark (figure 4.1), the research sample has properties in all segments and the differences per segment are small, especially in the larger categories. The difference is largest in the 'PRTE / LRTE (Peripheral or Large Retail Trade Establishment) and spread' segment. This is compensated by a lower presence in the smaller categories.

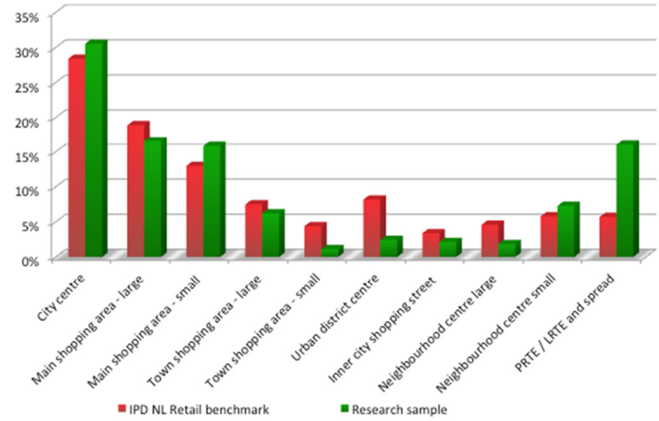


Figure 4.1: Research sample vs. IPD Netherlands Retail

*Source: **(CBRE, 2012)(IPD, 2012)***

To calculate the representativeness of this sample compared to the IPD benchmark universe, Pearson's Chi Square test is used. This test is seen as the most appropriate to test the representativeness of a sample (Baarda, De Goede & Van Dijkum, 2011, p. 86) (ASRE, 2012). The test results in a value of 29.01 (p = 0.001), indicating that this research sample is not representative for the total IPD universe. The main difference lies (as expected) in the 'peripheral large retail and spread' category and contributes 18.65 (64%) to the total Chi Square score of 29.01. Without this category, the sample is representative for the IPD benchmark universe. Since the IPD benchmark only covers 60% of the total retail assets owned by institutional investors ('the total population'), no statement can be made about the research sample against the total population. However, since all retail categories are represented in the research sample, the sample, except for the 'peripheral large retail and spread' category, is representative and the IPD covers only 60% of the total institutional universe, this research sample could be marked as 'fairly representative' for the total population.

Energy labels

The energy label consists of nine categories, ranging from A++ to G. Every energy label category corresponds with an interval range of Energy Index scores. The Energy Index score is calculated by a formula that takes several energy efficiency measures of the property into account, such as the thickness of the isolation, the type of material that is used in the walls, the total surface of the glass in the property, etc. The interval ranges of the energy index values are not the same for all the energy label categories, as is illustrated in figure 4.3.

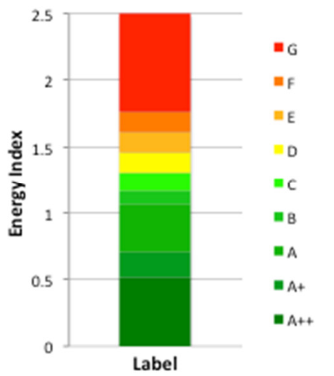


Figure 4.2: Energy index intervals per energy label

In the Netherlands, a database of all the energy labels is kept by the government agency AgentschapNL, which also publishes the number of energy labels per category. The IPD also requests the energy labels of the properties from their investors.

Distribution over the energy label categories

In figure 4.2, the distribution of the energy labels per category of the total Dutch database and the IPD benchmark is compared with the research sample. Compared to all the available Dutch energy labels for retail properties, the research sample has less properties with an A++ or A+ label and relatively more properties with an A and C label. When the distribution of the research sample is compared to the database of AgentschapNL, the Chi Square test result is 24.35 (p = 0.004), meaning that the research sample is not representative for the AgentschapNL database. The main difference lies in the A+ category, which is much higher in the Agentschap NL database. This can be explained by the fact that energy labels are mostly obtained for newly built properties, which will have relatively more A++ and A+ labels due to stricter building codes. Since only 1,900 energy labels have been issued for retail properties, the distribution of the total universe is not known yet.

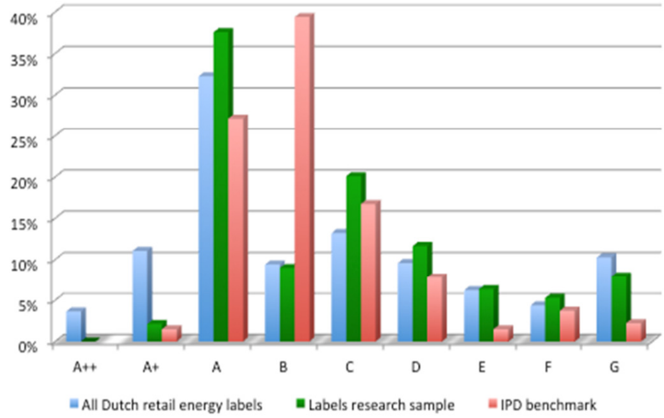


Figure 4.3: Research sample vs. Agentschap NL retail database
Source: (IPD, 2012) (CBRE, 2012) (AgentschapNL, 2011)

The IPD benchmark has less properties with an A label than the research sample, but far more properties with a B label and less with an E and G label. This is remarkable, since the B label category has the smallest bandwidth of all (see figure 4.2). The distribution of the energy labels in the research sample is not representative for the IPD benchmark, since the Chi Square test result is 84.48 ($p < 0.001$). In total, only 27% of the properties in the IPD benchmark have an energy label. Since CBRE Global Investors has submitted 17% of that (being 17% of the benchmark * 100% of the properties labeled), all the other investors have submitted energy labels of 10% of their properties, which might be their best properties that have been labeled first (due to the unusual high level of B labels). The IPD benchmark is therefore not representative for the total universe.

Since both benchmarks are also not complete in terms of their coverage of the total population of retail properties and the distributions of the energy labels are generally distributed in line with the two benchmarks, the research sample could be marked as 'fairly representative' for the total population.

4.2 Methodology

The data is analyzed with a multiple linear ordinary least square (OLS) regression analysis in SPSS. The general formula of the regression analysis is of the following form:

$$R = \alpha + b_1 * \text{energy index} + b_2 * \text{type of center dummy} + b_3 * \ln(\text{size of the total center}) + b_4 * \ln(\text{catchment area}) + b_5 * \ln(\text{property size}) + b_6 * \ln(\text{average m2 per lease}) + b_7 * \ln(\text{age}) + \varepsilon$$

Where:

R = Return characteristic

α = Constant

$b_1 \dots b_7$ = regression coefficients

ε = error term

Six different analyses were made to examine whether a sustainability premium exists in the historical real estate performance. The six analyses are based on the six return characteristics from Chapter 3 as dependent variables: *total return, income return, value per m², rent per m², operating costs and vacancy*.

In every regression analysis, the energy index has been inserted in the first step, so that the effect of the subsequently inserted variables on the model and on the influence of the energy index can be seen.

In each subsequent step of the regression analysis, an additional independent variable is included in the model. The order of the subsequent variables is based on the highest expected influence based on the literature review, as Field (2005) advises.

To strengthen the outcome of the model, the control variables that did not have a significant effect on the performance driver have been removed from the model. The data has been checked for multicollinearity, heteroscedasticity, dependent errors, non-linear relationships, not normally distributed residuals and outliers that strongly influence the gradient of the regression line.

Energy efficiency

Figure 4.3 shows the distribution of the Energy Index score in the sample. Since there are more properties with a green label than a non-green label, the distribution is slightly skewed to the left (+1.42). To test the normal distribution, the Kolmogorow-Smirnov test has been used, since this is the most used test (Field, 2005). The test results, (D(124) = 0.10, p = 0.004), indicate that the energy index is not normally distributed. Transformations to the data (such a log, ln, x^2 or √x) do not result in a normal distribution. For a proper statistical analysis, it is important that the variables are (as much as is possible) normally distributed and preferably on a continuous scale, instead of a categorical or interval scale. Since the Energy Index has a more normal distribution than the energy label and a continuous scale, the Energy Index has been used as measure of energy efficiency.

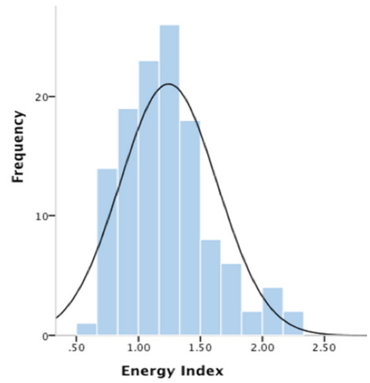


Figure 4.4: Histogram Energy Index

Performance drivers

The six performance drivers from Chapter 3 have been used as a basis for the statistical analysis. The method below has been used to come to the appropriate data per variable.

Total return

To obtain a reliable average total return (with less influences of one-off leasing deals or other noise), it is important to use an average that covers several years. However, the longer the period for the average, the longer the first year is away from the moment that the energy label was measured and the less reliable the link between the return and the energy label is. Therefore, the average total yearly return over the 5-year period from 2007 to 2011 has been used to obtain a good balance. To calculate the outperformance, the mean of all average property returns has been subtracted from the actual return of the specific property. Properties that were purchased or sold between 2007 and 2011 are excluded from the analysis, as well as outliers (see Appendix A.2). The Kolmogorov-Smirnov test shows that average total return was normally distributed (D(96) = .086, p = .075, see Appendix A.1), so no adjustments to the data have been made.

Income return

The average income return has also been calculated over the period 2007 to 2011 and the outperformance has been calculated by subtracting the mean from the actual income return of that specific property. Outliers and properties that have been sold or acquired between 2007 and 2011 have been excluded. Since the income return is normally distributed (D(97) = .066, p = .200), no adjustments are made.

Value per adjusted m^2

To come to the values per m^2, the values of the properties as of 31-12-2011 have been divided by the size of the property. Before that, the size of property was corrected (see 'adjusted property size' on the next page) for the amount of space on the floors of a property, since this has large impact on the rent and value. Three outliers have been excluded (see appendix A.2). Since the distribution was not normal, a natural log transformation has been applied. This has resulted in a normal distribution (D(121) =.064, p = .200).

Rents per adjusted m²

The rents per m² have been calculated by dividing the total rent of the property by the adjusted size, calculated the same way as the value per property. Two outliers have been excluded. Since the distribution was not normal, a natural log transformation has also been applied. This has led to a normally distributed sample: D(122) = .079, p = .062.

Average operating costs

The average operation costs are calculated by dividing the operating costs by the theoretical rental income (= actual rental income plus rental value of the vacancy) over the 2007-2011 period. Sold, acquired and outlying properties have been excluded. As Appendix A.1 shows, these outcomes are not normally distributed (D (98) = .119, p = .002) and transformations to the data do not make the distribution more normal. The distribution is positively skewed (+1.15), which can be explained by the fact that properties have 'large maintenance cycles' of 10 to 25 years, resulting in years with (far) higher maintenance costs than average.

Average vacancy

The average vacancy is calculated by dividing the amount of vacancy costs by the theoretical rental income over the period 2007-2011. Sold, acquired and outlying properties have been excluded. This distribution deviates significantly from normal: D(99) = .343, p = .000. A strong positive skewness (+4.50) to the left and a high upward kurtosis (+24.12) exists, since most properties did not have any vacancy and only some were (partly) vacant for a longer period. Transformations of the data could not make the distribution normal.

Control variables

The basis for the selection of the control variables are the variables resulting from the literature review in Chapter 3. Due to data limitations or lack of objective measurement methods, not all the control variables from the literature review have been included in the regression models. The focus has been on predictors on portfolio management (macro) level and objectively quantifiable predictors. This is shown in figure 4.5:

Level	Control variables resulting from the literature review	Control variables used in the model
macro	center category within the hierarchy	center category within the hierarchy
macro	size of the total center	size of the total center
macro	catchment area: total population, age and average income	catchment area: total population
meso	size of the property	size of the property
meso	age of the property	age of the property
meso	location within the retail area	-
meso	number of people passing by the retail unit	-
micro	average retail unit size	average retail unit size

Figure 4.5 Predictors from the literature review and the used predictors

Most control variables from the literature review have been included in the research model. The average age and income of the population in the catchment area have not been included due to data availability issues. The location in a retail area and the number of people passing by the unit have also not been included in the research model. This data is available from Locatus, but only for large and medium-sized centers, resulting in only 70 observations (65%). Therefore, these numbers are not included.

Center category within the hierarchy

The IPD index uses the Locatus segmentation for its extensive analyses and uses its own more compact segmentation for more integrated analyses. Since the Locatus segmentation would result in too many dummy variables and some categories would contain 1 or 2 properties, an adjusted IPD segmentation has been used.

Locatus segmentation	IPD segmentation	Research segmentation
Large city centers	Large centers	Large city centers
Main shopping area - large	Medium centers	Medium centers
Main shopping area - small	Medium centers	Medium centers
Urban district centre	Supporting retail areas	Medium centers
Town shopping area - large	Small centers	Small centers
Town shopping area - small	Small centers	Small centers
Inner city shopping street	Supporting retail areas	Small centers
Neighbourhood centre - large	Supporting retail areas	Small centers
Neighbourhood centre - small	Supporting retail areas	Small centers
PRTE/LRTE and spread	Supporting retail areas	Peripheral large retail

Figure 4.6: Used center categorizations

This was done since IPD also has the category 'supporting retail areas', containing both small centers and PRTE/LRTE/spread locations. As this would distort the analyses, the 'supporting retail areas' category has been allocated to the small center segment and the PRTE/LTRE segment.

Age

The age of the property has been calculated by the formula 2012 -/- construction year. The construction years have been obtained for all the properties. Since there are relatively much younger properties (up to 50 years old) and some very old properties (100-200 years old), this distribution is positively skewed. Therefore, a natural log transformation has been applied, strongly improving the normality of the distribution (D(124) = .083, p = 0.034), but the age of the properties is still significantly not normally distributed.

Adjusted property size

The size of property has been corrected for the amount of space on the several floors of a property, since the location of the m^2 has a large impact on the rent and value of the property. The control factors per floor are averages, derived from Bolt (1995, 2003), Mols (2006) and SCN (2012). The following percentages are used:

Floor	-2	-1	0	1	2	3	4	5
Percentage	10%	25%	100%	30%	15%	10%	10%	10%

Figure 4.7: Correction percentage per floor *Sources: (Bolt, 2003, p. 107) (Bolt, 1995, p. 297) (Mols, 2006), (SCN, 2012)*

Since there are many small properties (<5,000 m^2) and some (very) large ones, the distribution is skewed to the left. A natural log transformation has made the sample normally distributed (D(124) = .074, p = 0.095).

Average m^2 per lease

The average m^2 per lease is calculated by dividing the size of the property by the number of leases. Since many small retail units are present and only a few (very) large ones, this distribution is also positively skewed. Transforming the data by taking a natural log enhanced the normal distribution, but this is still not normally distributed (D(124) = .162, p = 0.000).

Catchment area

The catchment area of a retail property has been calculated by combining the type of center the property lies within and the amount of inhabitants with a range of 2, 5 or 10 kilometers, as indicated by Locatus. For properties in large and medium city centers, the number of inhabitants within a range of 10 km has been used. For properties in urban district centers and small city centers, the inhabitants within a range of 5 km have been used. For neighborhood centers, the number of inhabitants within a range of 2 km has been used. This data has been obtained for all the retail properties. Since the distribution of this variable is positively skewed, a natural log transformation has been applied. This does not lead to a normal distribution (D(124) = .134, p = .000), but this does improve the normality of the distribution (for more information, see the data in Appendix A.1).

Size of the total center

The size of the total center is defined as the sum of the sales area of all properties in a specific center and has been derived from the database of Locatus for each specific property. Since there are relatively many small centers and only a few large centers, the distribution is positively skewed. A natural log transformation improves the normality of the distribution to D(124) = .145, p = .000), but still not to a normal distribution.

Increase in vacancy

The increase in vacancy is only used in the regression analysis of the total return, since this has a large impact on the value change of a property. The increase in vacancy is denominated in percentage points and is calculated by subtracting the vacancy level of 2007 from the vacancy level of 2011. Due to the large amount of properties without vacancy, the distribution has a large (19.31) positive kurtosis (a very pointy distribution) and a high (+4.17) positive skewness. Due to the large amount of zeros, a natural log or square root transformation was not useful and the original data has been used.

Change in rent

This variable is also only used in the regression analysis of the total return, due to its large impact on the value change of a property. The change in rent is calculated by subtracting the rent of 2007 from the rent of 2011 and dividing this by the rent of 2007. Many properties have an average rent increase (equal to the inflation), therefore the distribution has a very high (upward) kurtosis (+22.4). Since some properties have had very high rent increases (up to +120%), the distribution is skewed to the left (+3.70). Due to the high kurtosis, a log or square root transformation did not have much positive influence and the original value has been used.

4.3 Limitations to the data

The main limitation of the data is the relatively small sample size. The sample size of 124 properties is much less than the sample sizes of the studies on the US office markets, with up to 15,000 properties in those samples. Although this sample represents around 10% of the institutionally owned real estate and around 10% of the produced energy labels for retail properties in the Netherlands, the distribution proved only to be 'fairly representative' for the retail properties in the Netherlands. In addition, as CBRE Global Investors aims to manage its portfolio actively and focuses on high quality properties, properties of lower quality intend to be sold and are therefore less present in this portfolio. This could lead to a 'small sample bias' or 'sampling error'.

On the other hand, the advantage of a small sample is that the data has been checked thoroughly for errors. This is much more difficult for large databases. This could have contributed to the relatively high explanatory power (R^2) of the regression model. As a result, the 'measurement error' is expected to be low. Furthermore, this sample covers a total investment portfolio, not only the 'good' properties. This results in a low 'availability bias', meaning that both the 'good' and 'bad' properties have been included in the sample.

4.4 Summary

The relation between the sustainability level of properties and their performance is examined on a research sample of 124 properties from the retail properties managed by CBRE Global Investors. The property characteristics are provided by CBRE Global Investors and Locatus, the return data is provided by the IPD and the energy labels are provided by external consultants Search and Innax.

The distribution of the energy labels in the research sample is comparable to the distribution of all retail property energy labels in the Netherlands. Furthermore, the distribution of the retail property types is comparable to the distribution in the IPD Dutch Retail property database. Therefore, the data is fairly representative for the universe of retail properties owned by institutional investors in the Netherlands.

The data analysis was done using SPSS and the (significant) differences between the energy label segments and the performance drivers and the control variables were calculated first. After that, an OLS regression analysis was done to determine the origin of the difference and whether a sustainability premium exists.

Chapter 5: Results - differences between green and non-green properties

In this chapter, the results of the historical analysis are presented. This chapter will answer the following research question:

Is there a difference between sustainable and not sustainable properties?

The descriptive statistics regarding the green and non-green properties are examined first in paragraph 5.1. After that, in paragraph 5.2, the results of the significance test will be presented, indicating whether the differences are statistically significant. In paragraph 5.3, the results will be matched with the results from the earlier studies described in Chapter 2.

5.1 Descriptive statistics

To see whether there are differences between 'green' properties (see Appendix B, a green energy label A to C, Energy Index < 1.30) and 'non green' properties (energy label D to G, Energy Index $\geq$ 1.30), the statistics for these groups are described for the performance drivers and the control variables in figure 5.1:

Descriptive statistics		N	Mean	Median	SD	Min	Max
Performance drivers							
Total return '07- '11 (%)	Green	65	7.97	7.86	2.57	0.06	19.94
	Non-green	35	6.99	7.09	3.78	-10.40	15.29
Income return '07-'11 (%)	Green	64	6.18	6.28	0.68	4.34	8.01
	Non-green	33	5.77	5.73	0.61	4.07	6.84
Rent per adjusted m^2	Green	80	316	230	206	73	923
	Non-green	42	408	371	236	123	995
Value per adjusted m^2	Green	80	4937	3459	3770	960	16631
	Non-green	41	6781	5724	5061	1675	22961
Vacancy level '07-'11 (%)	Green	65	0.97	0.00	2.20	0.00	13.06
	Non-green	34	0.35	0.00	0.89	0.00	3.58
Operating costs '07-'11 (%)	Green	64	10.43	10.15	3.70	2.35	18.93
	Non-green	34	10.98	9.29	5.53	4.60	28.03
Control variables							
Energy index	Green	81	1.03	1.03	0.18	0.63	1.29
	Non-green	43	1.65	1.52	0.35	1.31	3.12
Age (years)	Green	81	32.2	23	30.437	2	192
	Non-green	43	52.07	42	31.349	14	121
Adjusted property size (m^2)	Green	81	5122	2847	6068	75	27009
	Non-green	43	1835	597	2292	57	9137
Average m^2 per lease	Green	81	1192	375	2082	61	13407
	Non-green	43	754	265	1845	25	11821
Center size	Green	81	41862	28925	49423	2085	258969
	Non-green	43	61447	47281	54003	1303	258969
Catchment area	Green	81	175398	124475	190464	4031	908125
	Non-green	43	167186	156335	184613	16291	877413

Figure 5.1 Descriptive statistics of the green and non-green properties

Performance drivers

The total return of the green properties is around 1% higher than the non-green properties, but the returns of non-green properties are more spread. This can also be seen in the income return, where green properties have a 0.5% higher income return than non-green properties. Non-green properties have (much) higher rents and values per adjusted m^2 than green properties; also, the standard deviations of the rents and values of non-green properties are higher, resulting in a broader range (mostly upward) for non-green properties. Green properties have a higher average vacancy rate and a higher maximum vacancy. The operating costs are on average 0.5% lower for green properties, but the median operating costs of non-green properties are lower. This is caused by some non-green properties having (very) high operating costs, which increase the average.

Control variables

There is a strong relation between the energy index and the age of properties. Green properties are much younger (32 years on average) than non-green properties (52 years on average). In addition, green properties are larger on average than non-green properties. The standard deviation for the size of green properties is also larger, resulting in a higher maximum size of the green properties. This effect can also been seen in the average size of retail units (m^2 per lease): the units are larger in green properties. The non-green properties are in centers with a larger average size. The catchment areas are about the same for both groups.

5.2 Differences between the green and non-green properties

To see whether there are statistical differences between 'green' properties and 'non green' properties, the groups have been compared using a t-test for the normally distributed variables and a Mann-Whitney test for the not normally distributed variables. The result of the mean comparison for the return drivers are as follows:

Variable	Normally distributed?	Test	Significant difference?	p	(Standardized) t	Median Green	Median Non-Green	Spearman's Correlation
Total return '07-'11	Yes	t-test	No	.475	-0.717	7.86%	7.09%	-.15
Income Return '07-'11	Yes	t-test	Yes	.004***	-2.963	6.28%	5.73%	-.39***
Value per adjusted m2	No	Mann-Whitney	Yes	.020**	-2.233	€ 3459	€ 5724	.29***
Rent per adjusted m2	No	Mann-Whitney	Yes	.027**	-2.209	€ 230	€ 371	.28***
Average vacancy '07-'11	No	Mann-Whitney	No	.055*	1.919	0.97%	0.35%	-.15
Average operating costs '07-'11	No	Mann-Whitney	No	.726	0.351	10.43%	10.98%	.03

* Significant at the 10% level ** Significant at the 5% level *** Significant at the 1% level

Figure 5.2 Mean comparison results performance drivers

The income returns of green properties are significantly higher than the income returns of non-green properties (at 99% confidence level). Furthermore, the rents and values of green properties are significantly lower than the rents and values of non-green properties (at 95% confidence level). The difference between the total returns of green and non-green properties is not significant. Regarding the average vacancy level, there is no significant difference at the usual 95% confidence level, but at the 90% confidence level green properties have a higher vacancy. For operating costs, there is no significant difference.

The differences between the control variables of the green and non-green properties are shown in figure 5.3:

Control variable	Normally distributed?	Test	Significant difference?	p	Standardized t	Median Green	Mediaan Non-Green	Spearman's Correlation
Age	No	Mann-Whitney	Yes	.000***	-4.192	23	42	.44***
Size of the property	No	Mann-Whitney	Yes	.000***	3.714	5122	1835	-.32***
Average m2 per lease	No	Mann-Whitney	Yes	.013**	2.475	375	265	-.21**
Size of the total center	No	Mann-Whitney	Yes	.001***	-3.369	28925	47281	.47***
Catchment area	No	Mann-Whitney	No	.921	-0.100	124475	156335	.10

* Significant at the 10% level ** Significant at the 5% level *** Significant at the 1% level

Figure 5.3 Mean comparison results control variables

The difference in age is significant: green properties are significantly younger. The differences in size of the property and of the units are also significant: green properties are significantly larger and have significantly larger units. The fact that green properties are younger can be explained due to the building codes, in which the energy efficiency requirements have been made stricter in the past decennia. The fact that green properties are significantly larger could be explained by the fact that large properties have less surface compared to their volume, so that less energy can leak away. This can also be explained by a correlation with age, reflecting the trend that retailers have requested larger units in the past decennia. The size of the total center is also significant, non-green properties are located in larger centers. This is quite remarkable, since the location within a city is not a component in the calculation of the energy efficiency. This could be due to either a correlation with factors such as age, or by that fact that properties in the center of larger cities have an interior that consumes more energy or a shop front that has more open space. This relation will be explored more in detail in Chapter 6. The difference in catchment area is not significant.

Since the location type is a dummy variable, the type of center could not be integrated in the significance test. Therefore, the characteristics of the properties in the center categories are displayed in figure 5.4:

Type of center	Amount	Average Energy Index	Average Energy Label	Average age	Average size	Average catchment area	Average center size (m2)	Average value / adj sqm	Average rent / adj sqm	Average total return (%)	Average income return (%)
Large centers	16	1.41	E	60	6272	452916	151465	€12543	€687	9.46	5.25
Medium centers	68	1.30	C	45	3144	137265	43267	€5846	€375	6.86	5.89
Small centers	28	1.05	B	23	4242	52194	6140	€2547	€180	8.25	6.54
Peripheral large retail	12	1.06	B	16	17780	279511	41300	€1777	€132	8.27	6.89

Figure 5.4 Characteristics per type of center

The properties in large centers are the oldest properties and have the highest (less green) energy index. As expected, the average catchment area and average center size is highest in the large centers. The values and rents are highest in the largest centers, in line with the theory. This also results in lowest average income return, but the highest average total return, due to a large capital appreciation. The smaller the center, the younger the properties and the lower (greener) the energy index. The income return rises for smaller centers, but due to fluctuating capital appreciation, the total return has no linear relation. To see whether the visible relation between the energy label and the rents, values and return arise from the energy efficiency or from other factors, a deeper regression analysis is made in the next chapter.

5.3 Conclusion and evaluation with results from the literature review

In the literature review, no study with a significant difference between the total return and the sustainability level was found. With the insignificant difference found in this study, the results are the same as in the earlier studies. The significantly higher income return has not been reported in earlier studies and is a new finding.

Almost all studies in the literature review find a higher rent and value for green office and residential properties. The higher rents and values for *non-green* retail properties found in this study are contrary to the earlier findings in the office and residential sector. This is also a counter-intuitive finding; this difference will be analyzed in depth in the next chapter.

The (insignificant) lower vacancy level for *non-green* properties is also contrary to the findings of the studies in the literature review, since most studies find lower vacancy rates for green office properties. The insignificant difference in the operating costs is also not in line with findings from earlier studies, since several studies indicated lower operating costs for green office properties.

Grouping the characteristics of the properties into center categories showed that there were also large difference, depending on the type of center. The regression analysis in the next chapter can show whether there is a premium for sustainability or if the differences are caused by the other variables.

Chapter 6: Analysis - effect of sustainability on historical real estate performance

In this chapter, the results of the historical analysis are presented. This chapter will answer the following research question:

Is the difference in historical performance caused by the sustainability level of the properties?

To answer this question, first, the correlations between the energy index and the control variables are examined in paragraph 6.1. Subsequently, paragraph 6.2 shows the results of the regression analyses for the six performance indicators. In paragraph 6.3, the results of the regression analysis will be compared to the results from earlier studies and conclusions will be made.

6.1 The relation between the energy label and the other control variables

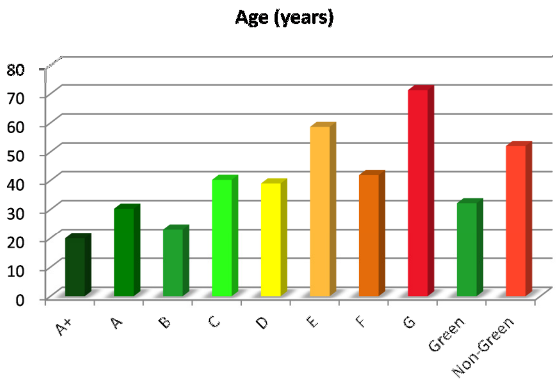
To examine the relation between the energy label and the control variables (the size of the center, energy label, age and size of the property), first, the normal (zero-order) correlations are calculated. After that, partial correlations are calculated, holding the influences of the other control variables stable. The results of this analysis are seen in figure 6.1:

Correlation to the energy index	ln (size of the total center)	ln (age)	ln (adjusted property size)	ln (catchment area)	ln (average m2 per lease)	Change in rent '07-'11	Increase in vacancy '07-'11
Zero-order correlation	.37***	.44***	-.50***	-0.5	-0.16	0.01	-0.17
Partial correlation	.28***	.18**	-0.13	-0.07	-0.02	-0.14	-0.06
	Corrected for the variables in this section					*Corrected for the variables left*	
** Significant at the 5% level *** Significant at the 1% level							

Figure 6.1 Zero-order and partial correlations between the energy index and the control factors

When the zero-order (normal) correlations are controlled for influences from the other variables, only a significant partial correlation between the size of the center and the age of the property with the energy index remains. The relation between the energy index and the age reflects the trend that building codes have demanded a higher energy efficiency in the past decennia. The partial correlation with the size of the total center is noteworthy since location within the city is no specific item in the calculation of the energy index. This could mean that in larger centers the interior lighting consumes more energy or the shop fronts are more open. The fact that the adjusted property and unit size do not have a remaining partial correlation anymore, means that their primary zero-order correlation was due to correlations with the age or center size.

The relation between the age and the energy label can be seen clearly in figure 6.2. The link between the energy label and the center size is more diffuse, since the properties with D and F labels are located in smaller centers (see figure 6.3).



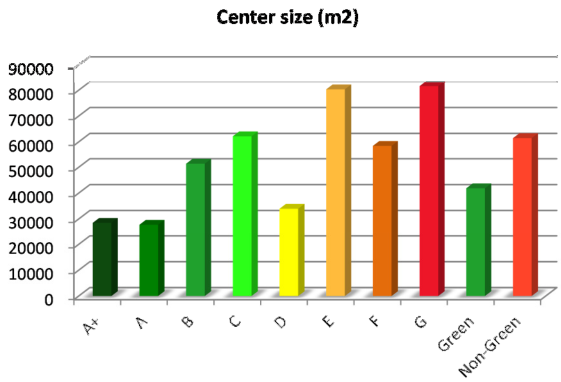


Figure 6.2 and 6.3: relation between the energy label and the age plus size of the center

It is remarkable that the energy index did not have any significant correlation with the change of rent between 2007 and 2011, while there is a significant relation between the energy index and the rent. The energy index also did not have any significant influence on the change of the vacancy level.

6.2 Regression analyses

Effect and regression analysis on the rent

The rent per adjusted m^2 and the natural logarithm of the rent show a positive relation to the energy index: the less green the label is, the higher the rent. This is also shown in figure 6.4 and 6.5:

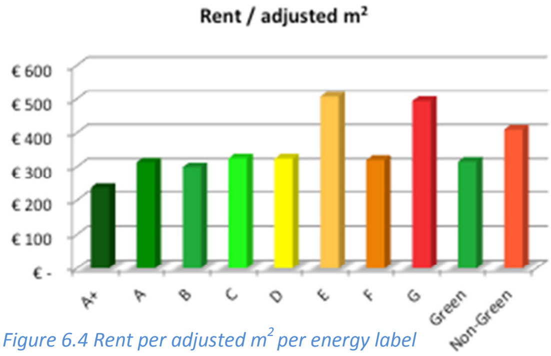


Figure 6.4 Rent per adjusted m^2 per energy label

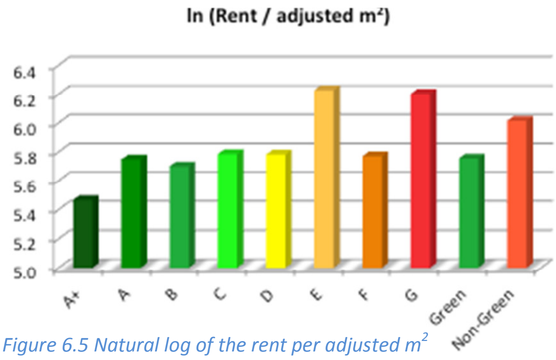


Figure 6.5 Natural log of the rent per adjusted m^2

The properties with an E- and G-label have especially higher rents than average. However, these properties are located mainly in high street retail locations of medium and large cities and not in smaller city centers. The properties with green labels are mostly shopping centers in smaller areas (districts or cities) with larger units, or shopping centers in larger cities with several floors that bring the average rent per m^2 down.

The energy index starts in the regression analysis with a significant positive effect on the value; however, this significant relation disappears completely when the location dummies are brought into the model. Also, the positive correlation disappears quickly. Almost all the variables have a significant influence on the rent, except for the energy index. The size of the catchment area has the most positive significant effect on the value, followed by a location in a large city and a larger size of the total center. The size of the property has the largest negative significant effect on the rent of a property, followed by a location in peripheral large retail center and a larger unit size. Contrary to the literature, age did not have a significant effect on the rent.

ln (rent per adj. m^2) regression model	**1**	**2**	**3**	**4**	**5**	**6**	**Standardized beta**
Variable added	**Energy Index**	**Location dummy**	**Center size**	**Catchment area**	**Property size**	**m^2/lease**	**model 6**
Coefficients							
Constant	5.044***	5.267***	3.103***	1.361***	2.707***	3.669***	
Energy Index	0.490***	0.288**	0.020	0.043	-0.111	-0.106	-.07
Dummy for large centers		0.782***	0.354***	0.171*	0.193*	0.264***	.14
Dummy for peripheral large retail		-0.770***	-0.770***	-0.978***	-0.750***	-0.518***	-.25
ln (Size of the total center)			0.250***	0.160***	0.144***	0.128****	.26
ln (Catchment area)				0.231***	0.231***	0.207***	.34
ln (Adjusted property size)					-0.130***	-0.106***	-.26
ln (Average m^2 per lease)						-0.128***	-.24
Partial correlations							
Energy Index with Rent per m^2	.31	.23	.02	.04	-.12	-.12	
Model fit							
R^2	.10	.44	.59	.68	.75	.79	
Adjusted R^2	.09	.42	.58	.66	.74	.78	
Change Adjusted R^2	.09	.34	.16	.08	.08	.04	
Sample size	122	122	122	122	122	122	

* Significant at the 10% level   ** Significant at the 5% level   *** Significant at the 1% level

Figure 6.6 The regression analysis of the natural log of the rent per adjusted m^2

The regression model explains the differences in rent to a large extent (due to the very high R^2 of 79% and adjusted R^2 of 77%). Only age and a location in a small center don't have a significant effect on rent and have been excluded from the analysis. It therefore leads to the conclusion, based on a high level of certainty, that the energy label does not affect the rent, but that the difference is caused by the fact that the non-green properties are located in a larger center, have a larger catchment area and a smaller unit and property size than green properties.

Effect and regression analysis on the value

The significance test showed that non-green properties had a higher value than green properties. This effect can also be seen for the energy labels:

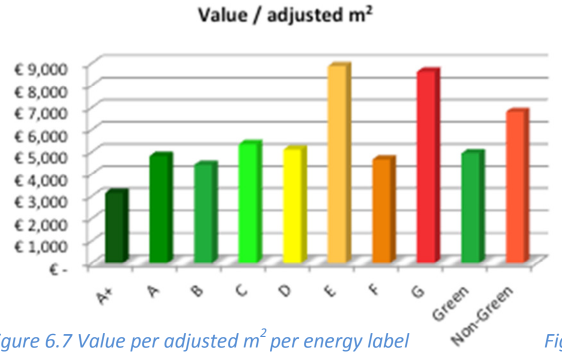


Figure 6.7 Value per adjusted m^2 per energy label

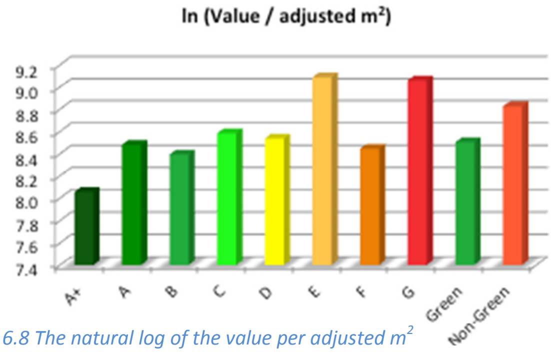


Figure 6.8 The natural log of the value per adjusted m^2

Just as in the rent, the properties with an E and G label have especially higher values. This is in line with the earlier findings that properties with non-green labels are more present in historic city centers of large and medium sized cities. The A+ category comprises two properties, one peripheral large retail property and one in a medium sized city. Therefore, the amount of properties in the A+ category may not be representative for the total. The natural logarithm shows the same, only the differences are larger at the lower values and smaller at the higher values, as intended.

The energy index starts in the regression analysis with a significant positive effect on the value; however, this significant relation disappears completely when the location dummies are brought into the model. The positive correlation declines also very quickly. The size of the catchment area has the most positive significant effect on the value, followed by a location in a large city and a larger size of the total center. The size of the property has the largest negative significant effect on the value of a property, followed by a peripheral location and a larger unit size. Contrary to the literature, age did not have a significant effect on the value.

ln (value per adj. m^2) regression model Variable added	1 Energy Index	2 Location dummy	3 Center size	4 Catchment area	5 Property size	6 m^2/lease	Standardized beta model 6
Coefficients							
Constant	7.628***	8.320***	5.504***	3.568***	5.206***	6.166***	
Energy Index	0.590***	0.352***	0.059	0.086	-0.103	-0.099	-.11
Dummy for large centers		0.957***	0.485***	0.277**	0.293***	0.362***	.30
Dummy for peripheral large retail		-0.859***	-0.861***	-1.092***	-0.814***	-0.581***	-.40
ln (Size of the total center)			0.275***	0.176***	0.150***	0.139***	.36
ln (Catchment area)				0.256***	0.259***	0.236***	.50
ln (Adjusted property size)					-0.163***	-0.140***	-.49
ln (Average m^2 per lease)						-0.128***	-.36
Partial correlations							
Energy Index with Value per m^2	.33	.13	.06	.08	-.11	-.11	
Model fit							
R^2	.11	.47	.62	.69	.78	.81	
Adjusted R^2	.10	.46	.60	.68	.77	.80	
Change Adjusted R^2	.10	.36	.14	.08	.09	.03	
Sample size	121	121	121	121	121	121	

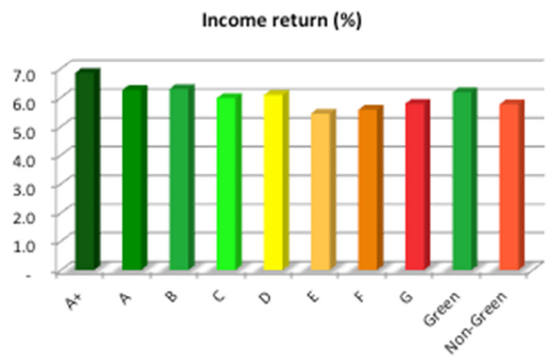
* Significant at the 10% level ** Significant at the 5% level *** Significant at the 1% level

Figure 6.9 The regression analysis of the natural log of the value per adjusted m^2

The variables in the research model lead to a very high explained variance (adjusted R^2) of 80%. In addition, the model leads to a high number of statistical significant influencing variables. Only age and a location in a small center did not have a significant effect on the value, they have been removed from the regression analysis. Therefore, the value of a property is not explained by the energy label, but by (in order of importance) the catchment area, property size, type of the center, size of the center and average m^2 per lease, just as the rents.

Effect and regression analysis on the income return

The t-test for income return showed that green properties had a significant higher income return than non-green properties. Figure 6.10 and 6.11 show this per energy label:



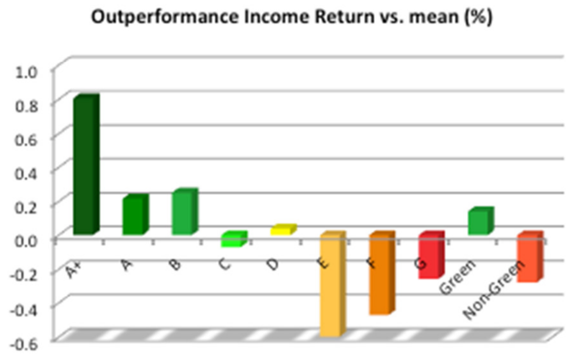


Figure 6.10 and 6.11: Income return and outperformance per energy label

The figures above show clearly that properties with a green energy labels have a higher income return than properties with a non-green label. However, the line is not totally linear, since the average income return of the properties with E and F labels is lower than the one for properties with a G-label.

In the regression analysis, the energy index has a strongly significant influence (at the 99% level) on the income return until in model 3 the center size is added; then, the relation is still significant but at the 95% level. After that, the significance totally disappears in model 5, resulting in a highly insignificant and very low b-value. The correlation falls from -.39 in the first model to .06 in the last model:

Income Return regression model	**1**	**2**	**3**	**4**	**5**	**6**	**Standardized beta**
Variable added	**Energy Index**	**Location dummy**	**Center size**	**Property size**	**m^2/lease**	**age**	**model 6**
Coefficients							
Constant	6.862***	6.831***	9.613***	7.373***	6.697***	7.380***	
Energy Index	-0.657***	-0.553***	-0.297**	-0.014	-0.018	0.066	.04
Dummy for large centers		-0.802***	-0.313*	-0.373**	-0.433***	-0.487***	-.24
ln (Size of the total center)			-0.308***	-0.255***	-0.232***	-0.211***	-.36
ln (Adjusted property size)				0.435***	0.149***	0.104***	.24
ln (Average m^2 per lease)					0.118***	0.118***	.21
ln (Age)						-0.196***	-.21
Partial correlation							
Energy Index with Income Return	-.39	-.36	-.22	-.01	-.02	.06	
Model fit							
R^2	.15	.30	.48	.63	.66	.68	
Adjusted R^2	.14	.28	.47	.61	.64	.66	
Change in Adjusted R^2	.14	.14	.18	.15	.03	.02	
Sample size	97	97	97	97	97	97	

* Significant at the 10% level ** Significant at the 5% level *** Significant at the 1% level

Figure 6.12: Results of the regression analysis of the income return

In the regression model for the income return, the variables result in a very high explained variance (R^2) of .68 and an adjusted R^2 of .66. It therefore leads to the conclusion, based on a high level of certainty, that the observed difference in income return is not caused by the energy label but by other factors. The catchment area and a location in a small center or at a peripheral larger retail location did not have any significant effect on the income return and are removed from the model. The higher income return for green properties is caused (in order of largest effect) by a location outside large centers, a larger property and unit size and a lower age of green properties.

Effect and regression analysis on the total return

The t-test for the total return showed a small but not significant difference between green and non-green properties. Figure 6.13 and 6.14 show per energy label the total return and the difference to the mean:

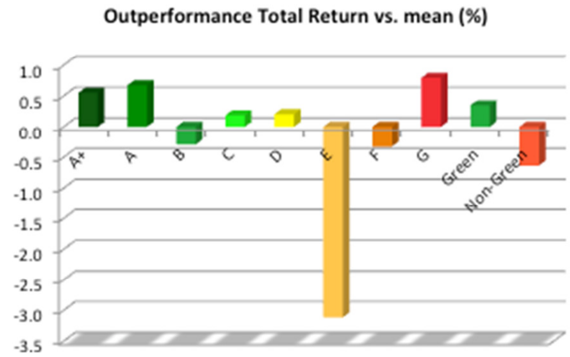


Figure 6.13 and figure 6.14: Total return and outperformance per energy label

The total return per energy label varies considerably, but no clear pattern can be seen. Overall, the green properties outperform the non-green properties, but this is due to a low total return of a small number of properties with an E label, thereby greatly influencing the average of the non-green properties. The differences in the average return of the other energy label segments are relatively small and explain the non-significance.

In all models of the regression analysis, the energy label does not have any significant influence on the total return. The partial correlation between the energy index and the total return is also very weak and changes from -.05 to +.05 in model 5. Since the variables from the model in Chapter 3 resulted in an adjusted R^2 of only .20 (explaining only 20% of the variation in the outcome), the change in vacancy and the change in rent have been added as variables. These two variables enhance the explanatory power of the model considerably, explaining 54% and 74% respectively. Since the rent and the vacancy are direct return drivers, the change in rent and change in vacancy are not used to analyze the relation between the energy label and total return.

Total Return regression model	**1**	**2**	**3**	**4**	**5**	6	7	**Standardized beta**
Variable added	**Energy Index**	**Location**	**Center size**	**Catchment area**	**Property size**	Δ vacancy	Δ rent	**model 7**
Coefficients								
Constant	8.007***	8.287***	13.253***	10.718***	4.111	2.917	1.184	
Energy Index	-0.337	-0.906	-0.433	-0.368	0.178	0.255	0.474	.11
Dummy for large centers		3.292***	4.135***	3.940***	3.389***	3.209***	1.800***	.32
ln (Center size)			-0.552*	-0.679**	-0.476	-0.467*	-0.450**	-.25
ln (Catchment area)				0.326	0.273	0.506*	0.546***	.29
ln (Adjusted property size)					.579***	0.444***	0.435***	.38
Change (%) in vacancy '07-'11						-0.203***	-0.172***	-.70
Change (%) in rent '07-'11							0.102***	.68
Partial correlations								
Energy Index with Total Return	-.05	-.13	-.06	-.05	.05	.04	.11	
Model fit								
R^2	.00	.13	.16	.17	.24	.56	.77	
Adjusted R^2	-.01	.11	.13	.13	.20	.54	.75	
Change R^2	-.01	.12	.02	.00	.06	.34	.21	
Sample size	97	97		97	97	97	97	

* Significant at the 10% level ** Significant at the 5% level *** Significant at the 1% level

Figure 6.6: Results of the regression analysis of the total return

The variables for locations in small and peripheral large centers and the average m^2 per lease did not have a significant effect on the total return and have been removed from the model. The energy index did also not have an influence on the total return in any model. The change in rent has the strongest positive effect on the return. A location in a large center and a large catchment area and large property size all have a moderate positive effect on the total return. An increase in vacancy has a strong negative effect on the total return.

Effect and regression analysis on the vacancy

The Mann-Whitney test resulted in a negative relation between the energy index and the vacancy rate at a 90% confidence level (p = 0.055). Figure 6.16 shows that properties with a B and C label have a higher average vacancy than non-green properties, with G labeled properties having an extremely low vacancy of 0.03%. However, all the properties with a G label are in the medium and large-sized city centers, as well as many properties with an E and F label. This could also influence the low vacancy rate.

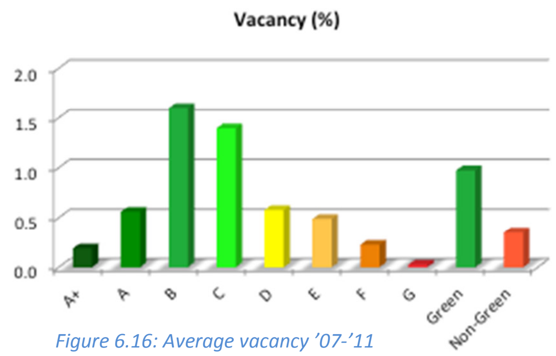


Figure 6.16: Average vacancy '07-'11

The regression analysis confirms this view. The correlation between the energy index and the vacancy level is weak in the first model and stays weak. The b-value between the energy label and the vacancy level is also highly insignificant in the third model (p = .776). The only variables that have a significant effect on the vacancy are the size of the property and the average m^2 per lease. These results suggest that larger properties have a higher vacancy rate and that properties with large unit(s) have lower vacancy rates. This can be explained since the larger properties with smaller retail units are mainly shopping centers, which have more vacancy on the higher levels. The largest properties are mostly supermarkets and peripheral large retail properties, which have relatively low vacancy rates in this sample.

Vacancy ('07-'11) regression model	1	2	3	Standardized beta
Variable added	**Energy Index**	**Property size**	**Property size**	**model 3**
Coefficients				
(Constant)	1.330**	-0.978	0.759	
Energy Index	-0.454	-0.027	-0.032	-0.07
ln (Adjusted property size)		0.131*	0.407***	0.35
ln (Average m^2 per lease)			-0.478***	-0.31
Partial correlation				
Energy Index with Vacancy '07-'11	-.10	-.01	-.01	
Model fit				
R^2	.01	.05	.12	
Adjusted R^2	.00	.03	.09	
Change R^2	.00	.03	.07	
Sample size	99	99	99	

* Significant at the 10% level ** Significant at the 5% level *** Significant at the 1% level

Figure 6.17 Regression model of the average vacancy level between 2007 and 2011

Since the average vacancy in the research sample is only 0.76% and 66 of the 99 properties did not have any vacancy in the study period between 2007 and 2011, the distribution of the average vacancy has a high kurtosis and a good regression analysis is therefore hard to make. This results in a low R^2 of 13% and an Adjusted R^2 of only 10%. The residuals are also not normally distributed and therefore not in line with the general assumptions of a linear regression analysis.

This is in line with the literature, which states that vacancy depends mainly on the location of the property (Locatus, 2012). The location type and number of people passing by has not been included in the model, since this data is only available for large and medium-sized cities. The location type, catchment area, size of the center and age did not have any significant effect and have been excluded in the model. The energy index has had no influence on the vacancy level.

Effect and regression analysis on the operating costs

The operating costs did not have a significant statistical difference resulting from the Mann-Whitney test. This can also be seen in figure 6.18, in which almost all the energy label categories have approximately the same average operating costs, expect for the property category with an F-label. This peak can be explained by two properties with relatively high average operating costs.

Also in the regression model, the energy index did not have any significant influence on the operating costs of the property, unlike the evidence in the literature for office properties.

Properties in large city centers have significant higher operating costs, as well as larger properties. Properties with large retail units have significantly lower operating costs. Retail properties in covered (shopping) centers also have higher operating costs, as well as properties with higher levels of vacancy:

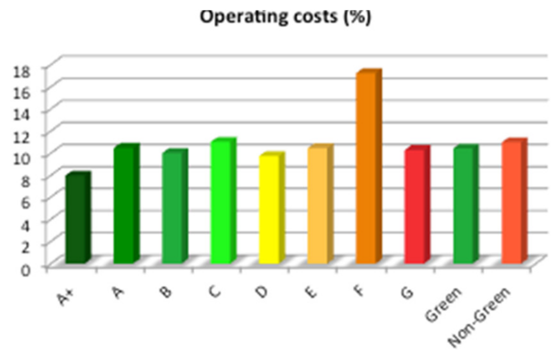


Figure 6.18 The average operating costs per energy label

Operating costs regression model	1	2	3	4	5	6	Standardized beta
Variable added	Energy Index	Location dummy	Property size	m^2/lease	Retail type	Vacancy	Model 6
Coefficients							
(Constant)	9.598***	9.746***	8.061**	16.024***	14.091***	13.432***	
Energy Index	0.813	0.494	0.806	0.646	1.203	1.274	.12
Dummy for large city centers		1.912	1.940	2.443**	2.726**	2.872**	.22
ln (Adjusted property size)			0.177	0.886***	1.065***	0.876***	.32
ln (Average m^2 per lease)				-2.128***	-2.192***	-1.948***	-.53
Dummy for standard units - covered					2.939**	3.257**	.22
Average vacancy 07-11						0.526**	.23
Change (%) in rent '07-'11							
Energy Index with Operating Costs	.08	.05	.07	.06	.12	.13	
Model fit							
R^2	.01	.03	.03	.30	.33	.38	
Adjusted R^2	-.01	.01	.00	.27	.30	.34	
Change in Adjusted R^2	-.01	.01	-.01	.27	.03	.04	
Sample size	98	98	98	98	98	98	

* Significant at the 10% level ** Significant at the 5% level *** Significant at the 1% level

Figure 6.19 The regression analysis of average operating costs between 2007 and 2011

The variance (Adjusted R^2) in the operating costs could be only be explained for 22% by the control variables in the research model. The catchment area, the size of the center and the age of a property had insignificant effects and have been removed from the model. The type of retail property and the average vacancy did have an additional explanatory effect (resulting in a Adjusted R^2 of .34) and have therefore been added to the regression model.

The significant large effect of the average vacancy on the operating costs could also explain the large difference that Fuerst & McAllister (2009) found in their study, resulting in significantly higher operating costs (up to 30%) for non-green properties. Their average vacancy rate for non-green offices was 37%, compared to a vacancy rate of 10% for green offices.

6.3 Conclusion

Although the energy labels have a significant relation with the rent, value and income return of retail properties, the regression analysis shows that these differences in historical performance are all caused by factors other than the energy efficiency of the property. This result is shown in figure 6.20:

Significant effect of the energy index on performance indicators	Total return '07-'11	Income return '07-'11	Rent per adjusted m^2	Value per adjusted m^2	Vacancy rate '07-'11	Operating costs '07-'11
Expected from the literature review						
Significant difference (at 95% level)	Unknown	Unknown	Yes	Yes	Yes	Yes
Effect for green properties of variable	-	-	Higher	Higher	Lower	Lower
Before regression analysis						
Significant difference (at 95% level)	No	Yes***	Yes**	Yes**	No*	No
Effect for green properties of variable	-	Higher	Lower	Lower	Higher	-
Correlation with energy index	-0.15	-.39***	.28***	.29***	-0.15	0.03
After regression analysis						
Significant effect (at 95% level)	No	No	No	No	No	No
Partial correlation with energy index	0	0.08	-0.09	-0.1	0.01	0.07
* Significant at the 10% level ** Significant at the 5% level *** Significant at the 1% level						

Figure 6.20 Summary of the results of the regression analyses

Unlike earlier studies on office and residential properties, no rent or value premium for sustainable retail properties has been found. The energy labels also do not have any influence on the vacancy or operating costs of retail properties, unlike the examined office properties in other studies.

Since the increase in vacancy and the change in rent over the period between 2007 and 2011 was also significantly not correlated with the energy index, no development towards pricing energy efficiency has taken place in past years. Based on these historical results can be concluded that the energy label did not have any influence on the performance of retail properties.

For the control variable, most expected effects are also found in this study:

Control variable	Expected relation to the performance of retail properties		Regression analysis
Center hierarchy	Positive	The higher the center in the hierarchy, the higher the rents and values	Confirmed
Size of the center	Positive	The larger the center, the higher the rents and values	Confirmed
Catchment area	Positive	The larger the catchment area, the higher the rents and values	Confirmed
Location in retail area	Positive	The better the location of a retail unit, the higher the rents and values and the lower the vacancy	Could not be confirmed
Size of the property	Negative	The larger the property, the lower the rent	Confirmed
Size of the retail unit	Negative	The larger the retail unit, the lower the rent	Confirmed
Age	Negative	The older a retail property, the lower the rents and values	Not confirmed

Figure 6.21 Expected and found relations between the control variables and the performance drivers

Due to the fact that data on the location of properties within the retail area was only available for about half the sample, this expectation could not be checked. Contrary to the literature, a significant difference between the rents and values of a property and their age could not be found.

This leads to the observation that properties with the highest rents and values are located in the larger centers with larger catchment areas and are smaller with a smaller average unit size. The properties located in the larger centers with higher rents and values also have lower income returns, reflecting the greater demand and lower risk profile. The total return is more difficult to predict due to effects of capital value change, but is determined most by the income return, change in rent and change in vacancy.

Chapter 7: Management advice - Scenario analyses about future effects of sustainability

For investment decisions, insight into possible future returns and accompanying risks is needed. Chapter 6 focused on the relation between sustainability and the historical financial performance of properties and specifically on the return component. The result that there is no relation between the energy labels of properties and the historical financial performance does not imply that there will not be a link in the future performance of the properties, which has also been stated in earlier studies (for example, Orlitzky, 2003). To see what the possible effects would be if sustainability would have an impact the performance of retail properties, this chapter will focus on the following sub question:

What are the possible future effects of sustainability on performance drivers?

To answer this question, five possible scenarios have been defined and the characteristics of four main types of retail properties have been outlined in paragraph 7.1. The effects of the five scenarios are examined in paragraph 7.2, and, in paragraph 7.3, the conclusions will be presented.

7.1 Methodology

Five possible scenarios have been defined in order to examine what the effect would be on the performance of retail properties if sustainability were to be taken into account in leasing, acquisition or taxation decisions:

- Scenario 1: the reported outcomes of earlier (office and residential) studies apply to retail properties
- Scenario 2: an upgrade from a non-green to a green energy label
- Scenario 3: the average energy costs per m^2 are taken into account in the rent calculation
- Scenario 4: a CO_2 tax is introduced
- Scenario 5: the energy label is taken into account in selection decisions and vacancy levels

To measure the effect on the investment return, a base case 10-year IRR model has been developed. This model and the underlying assumptions can be found in appendix C.

Since the performance characteristics of the retail properties vary per retail property type, the scenario analysis has been performed on four main types of retail properties: high street retail units, (larger) shopping centers, neighborhood centers and peripheral large retail properties. The main characteristics of these four property types are derived from the properties in the retail sample and the average of these properties has been used. The characteristics have been checked for representativeness by the retail experts. The characteristics are shown in figure 7.1.

Type of center	Average adjusted size	Average m2 / lease	value / adj m2	Average rent / adj m2	Average operating costs	Average vacancy 07-11 (%)	Average income return	Base case IRR (%)
High street retail units	721	361	8544	496	10.20	0.44	5.54	**6.64**
Shopping mall	6421	215	5397	361	13.52	2.11	6.20	**7.11**
Neighborhood Center	5287	273	2671	191	10.63	1.06	6.49	**7.80**
PRTE / LRTE	12842	3476	1777	132	8.19	0.26	6.89	**8.30**

Figure 7.1: Key characteristics of the main retail property types in the sample

The high street units are on average the smallest with also the smallest average unit size, while the peripheral large retail properties are as expected the largest with the largest units. The rents and value of the high street units are the highest and the large peripheral retail properties have the lowest rents and values per m^2, in line with the general retail theories. The operating costs are lowest for the peripheral large retail properties and highest for the shopping centers, since relatively more shopping malls are covered, resulting in higher maintenance costs for the common areas. The vacancy levels are the lowest for high street retail and large peripheral retail properties and the highest for shopping malls, due to vacancy that exists on the higher floors, basements and units at the back. Due to the low risk profile, high street retail properties have a low expected income and total return. The peripheral large retail properties have the highest income and total return.

7.2 Scenarios

Scenario 1: the reported outcomes of earlier (office and residential) studies apply to retail properties

In this scenario, the reported differences for office properties have been applied to retail properties. The findings vary per study and therefore an average has been taken. This results in an average rent premium of 5% and a value premium of 10% for green properties and in 15% higher operating costs and a 5% higher vacancy rate for non-green properties. The results of these scenarios for the four types of retail properties are shown in figure 7.2:

IRR	Base (%)	Rent +5%	Rent -5%	Value + 10%	Value -10%	Operating costs + 15%	Vacancy + 5%
High street retail units	6.64	7.14	6.15	7.49	5.90	6.58	6.35
Shopping mall	7.11	7.61	6.62	7.94	6.38	7.02	6.77
Neighborhood Center	7.80	8.30	7.30	8.60	7.09	7.72	7.43
PRTE / LTRE	8.30	8.79	7.80	9.08	7.61	8.24	7.92
Change in IRR							
High street retail units	6.64	0.50	-0.49	0.85	-0.74	-0.09	-0.29
Shopping mall	7.11	0.50	-0.49	0.83	-0.73	-0.13	-0.34
Neighborhood Center	7.80	0.50	-0.50	0.80	-0.71	-0.12	-0.37
PRTE / LTRE	8.30	0.49	-0.50	0.78	-0.69	-0.09	-0.38

Figure 7.2: Results of the scenario analysis based on the earlier (office) studies

The rent change of +/- 5% results in an IRR of +/- 0.5% for all types of properties. A value change of +/- 10% will have a higher impact and the impact will be greatest on the high street retail units (ranging between -0.74% and + 0.85%). A higher or lower operating cost has the smallest impact on the IRR; this only affects the IRR by -0.09% to -0.13%. An increase in the yearly vacancy of 5% has a medium impact on the IRR, ranging from -0.29% to -0.38%. However, the effect of vacancy can be multiplied when the rent levels and the value are also affected by the vacancy, which is not in the current vacancy scenario analysis.

Scenario 2: an upgrade from a non-green to a green energy label

To calculate the effect of an upgrade to a green label, the investment costs are important. The companies that issue the energy labels (Search and Innax) have also calculated the costs of improving the properties in this sample and provided tailor-made cost overviews per property. This data for all properties has been used to calculate the average of the costs to improve the energy index of the properties per energy label category:

The median costs to improve the energy index by 0.01 is € 1.13 per m^2. However, there are several properties with higher improvement costs. Therefore, the average (mean) cost to improve the energy index by 0.01 is € 1.75. Since a step in energy labels means an average step of 0.15 in the energy index (excluding a step from G to F), the costs to improve one label are around € 26 per m^2.

The costs to improve the energy index are highest for the properties with a D label, but this may also be due to a relatively small sample size.

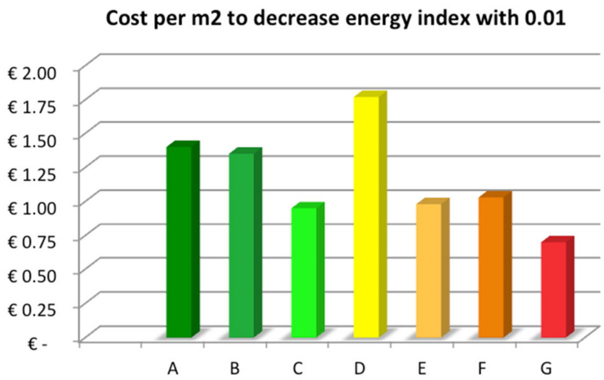


Figure 7.3 Energy label improvement costs

Beyond the properties with a D label, a small negative correlation can be seen, resulting in slightly lower costs for non-green properties to improve the energy index than for green properties. However, this relationship is weak and the difference is not statistically significant (p = .307). Therefore, the average cost of € 1.75 per m^2 to improve the energy index by 0.01 has been used.

The results of the analysis of this scenario are shown in figure 7.4:

Costs to improve the energy labels					
Energy label: mid interval	**C**	**D**	**E**	**F**	**G**
Average Energy Index	1.23	1.38	1.54	1.68	2.18
Difference with Mid-C label	-	0.15	0.31	0.45	0.95
Average costs per m2 for 0.01 increase	€ 1.75	€ 1.75	€ 1.75	€ 1.75	€ 1.75
Costs to Mid-C label per m2	€ -	€ 26.25	€ 54.25	€ 78.75	€ 166.25
Costs per retail type to C label	**m2**	**D**	**E**	**F**	**G**
High street retail units	721	€ 18932	€ 39126	€ 56796	€ 119903
Shopping mall	6421	€ 168564	€ 348366	€ 505692	€ 1067572
Neighborhood Center	5287	€ 138782	€ 286815	€ 416345	€ 878950
PRTE / LTRE	12842	€ 337094	€ 696660	€ 1011281	€ 2134926
Change in IRR (%) to C	**Base**	**D**	**E**	**F**	**G**
High street retail units	6.64	-0.04	-0.08	-0.11	-0.24
Shopping mall	7.11	-0.06	-0.12	-0.18	-0.38
Neighborhood Center	7.80	-0.13	-0.26	-0.38	-0.78
PRTE / LTRE	8.30	-0.20	-0.40	-0.58	-1.18

Figure 7.4: Costs to improve the energy labels and effect on the IRR

The costs to upgrade a property to a green label can be relatively high, especially for the larger (peripheral large retail) properties. On average, the larger properties also have a lower rent and value per m^2 and, as a result, the effect on the IRR of an upgrade to a green label is almost five times higher for peripheral large retail properties than for high street retail properties.

The impact of an upgrade from a G to a C label is the smallest for the high street retail properties and takes only 4% of the IRR away (from 6.64% to 6.40%), while an upgrade from a G to a C label for a peripheral large retail property can take away around 15% of the total IRR (from 8.30% to 7.12%). The impact on shopping malls is comparable with high street retail units and is relatively small, while the impact on the neighborhood centers is relatively high.

Scenario 3: the average energy costs per m^2 are taken into account in the rent calculation

It is relatively easy to calculate the average energy consumption of a retail unit because the average energy use per m^2 is already provided on the energy labels, based on the average Dutch climate, the average period that the property is used and an average user's behavior (see Appendix B). The average energy costs per m^2 have been calculated by combining the average energy consumption resulting from the energy labels with the average energy prices, as provided by the government agency AgentschapNL (2011). A large number of energy labels have been examined to calculate the average energy costs per energy label.

The results of this analysis are shown in figure 7.5. As expected, a strong linear relation between the energy label and the average energy costs can be seen. This results in average energy costs of below € 10 per m^2 for properties with an A(+) label to € 25 per m^2 for properties with a G label. The maximum difference of more than € 15 in energy costs is only 3% of the rent of high street retail properties and 4% of shopping mall units, but approaches 8% of the rent of neighborhood centers and 12% of peripheral large retail centers.

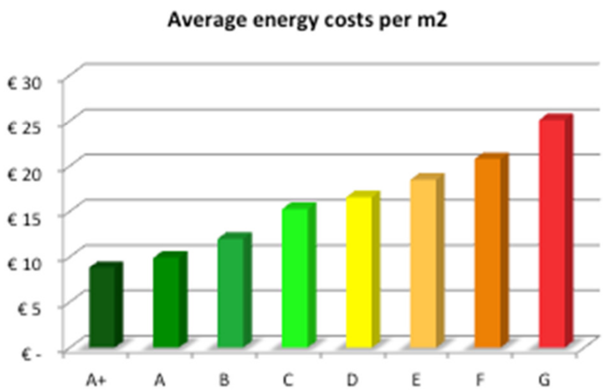


Figure 7.5 Average energy costs per energy label

Compared to the split between the green and non-green properties (between a C and D label), properties with a G label have circa € 9 higher energy costs and a property with an A label € 6 lower energy costs.

In this scenario, the basic assumption has been made that the rent changes as much as the energy costs differ, so that the ‘total housing costs’ (rent plus energy costs) remain the same. The results are shown in figure 7.6:

Effect change in rent on IRR	Base case	Difference A to C/D	Difference B to C/D	Diference C to C/D	Difference D to C/D	Difference E to C/D	Difference F to C/D	Difference G to C/D
Difference in rent		€ 6.02	€ 3.92	€ 0.65	-0.65	-2.58	-4.86	-9.18
High street retail units	€ 495.54	1.21%	0.79%	0.13%	-0.13%	-0.52%	-0.98%	-1.85%
Shopping mall	€ 361.41	1.66%	1.08%	0.18%	-0.18%	-0.71%	-1.34%	-2.54%
Neighborhood Center	€ 190.92	3.15%	2.05%	0.34%	-0.34%	-1.35%	-2.54%	-4.81%
PRTE / LTRE	€ 131.55	4.57%	2.98%	0.49%	-0.49%	-1.96%	-3.69%	-6.98%
Out-/underperformance compared to average								
High street retail units	6.64	0.12	0.08	0.01	-0.01	-0.05	-0.10	-0.19
Shopping mall	7.11	0.17	0.11	0.02	-0.02	-0.07	-0.13	-0.25
Neighborhood Center	7.80	0.32	0.21	0.03	-0.03	-0.14	-0.25	-0.48
PRTE / LTRE	8.30	0.46	0.30	0.05	-0.05	-0.20	-0.37	-0.70

Figure 7.6: The difference in energy costs compared to the rent

The difference in energy costs has an effect of -1.9% up to +1.2% for high street properties and an effect of -7.0% to +4.6% for peripheral large retail properties. For high street properties, this leads to an outperformance +0.12% with an A label to an underperformance of -0.19% for high street retail properties with a G label. Peripheral large retail properties with an A label outperform with +0.46% and peripheral large retail properties with a G label underperform with -0.70%.

Scenario 4: a CO_2 tax is introduced

As the results from Chapter 2 and the UNEP (2009) recommendations indicate, the introduction of a CO_2-tax could be an effective measure to reduce CO_2-emissions. UNEP (2009) recommends that the rate is a combination of higher taxation on the undesired levels (high CO_2-emissions) and lower taxation on desired levels (low CO_2-emissions). This would give property owners an incentive to improve the energy efficiency of their properties. A comparable system is also used in the Netherlands with lease cars. Since the future rate of such a tax is unknown, the current Dutch real estate WOZ-tax has been used as a basis. The tax rate is determined by the municipalities and therefore the rate varies. The average actual WOZ-tax rate in the research sample is 0.2% of the value of the property and this has been used as the basis for a future CO_2-tax.

The assumption is made in this scenario that when a CO_2 tax is introduced, the UNEP (2009) advice is followed and the tax rate will be dependent on the CO_2-emission and / or energy labels, just as with Dutch (lease) cars. The tax rate is assumed to be an additional tax, affecting all properties and varying from 0% for an A++ label to 0.4% for properties with a G label. The average rate is thus around 0.2%, equal to the current property (WOZ) tax rate. The effects of such a rate are displayed in figure 7.9:

Effect CO2 tax on IRR	Base case	A+	A	B	C	D	E	F	G
Yearly tax	**Value**	**0.05%**	**0.10%**	**0.15%**	**0.20%**	**0.25%**	**0.30%**	**0.35%**	**0.40%**
High street retail units	€ 6162341	€ 3081	€ 6162	€ 9244	€ 12325	€ 15406	€ 18487	€ 21568	€ 24649
Shopping mall	€ 34656972	€ 17328	€ 34657	€ 51985	€ 69314	€ 86642	€ 103971	€121299	€ 138628
Neighborhood Center	€ 14121651	€ 7061	€ 14122	€ 21182	€ 28243	€ 35304	€ 42365	€ 49426	€ 56487
PRTE / LTRE	€ 22822900	€ 11411	€ 22823	€ 34234	€ 45646	€ 57057	€ 68469	€ 79880	€ 91292
Change in IRR									
High street retail units	6.64	-0.05	-0.10	-0.15	-0.20	-0.25	-0.30	-0.36	-0.41
Shopping mall	7.11	-0.05	-0.10	-0.15	-0.20	-0.25	-0.30	-0.36	-0.41
Neighborhood Center	7.80	-0.05	-0.10	-0.15	-0.20	-0.26	-0.31	-0.36	-0.41
PRTE / LTRE	8.30	-0.05	-0.10	-0.16	-0.21	-0.26	-0.31	-0.36	-0.41
Out-/underperformance compared to average									
High street retail units	6.42	0.18	0.13	0.08	0.03	-0.03	-0.08	-0.14	-0.19
Shopping mall	6.89	0.18	0.13	0.08	0.03	-0.02	-0.08	-0.14	-0.19
Neighborhood Center	7.57	0.18	0.13	0.08	0.03	-0.03	-0.08	-0.13	-0.18
PRTE / LTRE	8.07	0.19	0.14	0.08	0.03	-0.03	-0.07	-0.12	-0.18

Figure 7.9: Effect of a CO_2 tax rate on the performance of properties

The effect on the IRR varies for all types of properties between -0.05% and -0.41%. Since the rate is lower for green properties, they can outperform non-green properties with an IRR difference of +0.37%.

Scenario 5: the energy label is taken into account in selection decisions

If the energy label of a property is taken into account in leasing decisions, an important factor is how many properties a retailer can choose from. On locations with low vacancy, there are few options available. On locations with high vacancy, the retailer can choose out of a wide range of properties and can apply more selection criteria. Therefore, the vacancy rate on a location determines largely how much impact the energy label can have on the demand for a specific property. As figure 7.7 shows, the vacancy on the location segments ranges between 5.9% and 9.7%, with an average of 7.1% on 31-12-2011.

Location segment and vacancy	
Large centers	**6.3%**
Large city centers	6.3%
Medium centers	**7.9%**
Main shopping area - large	9.7%
Main shopping area - small	8.0%
Urban district center	5.9%
Small centers	**7.1%**
Town shopping area - large	7.7%
Town shopping area - small	6.7%
Inner city shopping street	7.8%
Neighbourhood center - large	6.5%
Neighbourhood center - small	6.9%
PRTE/LRTE and spread	**7.1%**
PRTE/LRTE	7.1%

Figure 7.7 Vacancy per location segment Source: (Locatus, 2012)

Research firm Droogh Trommelen & Partners (DTNP, 2009) states that a friction vacancy level of around 5% is healthy. This means that all location segments have a level of vacancy that is above the healthy friction rate. According to research firm Locatus (2012), the vacancy level in the Netherlands does not depend on type of center, but on the location of the property within the center. The potential impact of the energy label will therefore depend on the location within the center. Figure 7.8 shows the vacancy rates per type of location:

A-locations	Vacancy	Impact	B-locations	Vacancy	Impact	C-locations	Vacancy	Impact
A1	2.0%	Low	B1	7.2%	Medium	C	13.5%	High
A2	3.4%	Low	B2	12.5%	High			

Figure 7.8: Vacancy per type of location *Source: (Locatus, 2012)*

In figure 7.8, it can be seen that the vacancy rate at A locations is very low and below the friction rate. At B1 locations, the vacancy rate is already above the friction rate, and the vacancy rate at B2 and C locations is relatively high. Potential tenants can choose there from multiple properties, and the potential impact of energy labels is therefore highest at B2 and C locations. At A locations tenants do not have many properties to choose from and the impact of the energy label is therefore expected to be low. So, although most of the properties at prime locations in the historical centers have a non-green energy label, this is expected to have less impact, as long as it is concerns A locations.

7.3 Summary and conclusions

To examine the possible future effects of the sustainability level of properties on their performance, the effects of several scenarios have been analyzed. The results of these scenarios can be found in figure 7.9:

	High street retail		Shopping mall		Neighbourhood center		Peripheral large retail	
IRR (10 years)	**A**	**G**	**A**	**G**	**A**	**G**	**A**	**G**
Base case (%)	**6.64**	**6.64**	**7.11**	**7.11**	**7.80**	**7.80**	**8.30**	**8.30**
Scenario 1: Office market								
Rents: +5% for green, -5% for non-green	0.50	-0.49	0.50	-0.49	0.50	-0.50	0.49	-0.50
Value: + 10% for green, -10% for non-green	0.85	-0.74	0.83	-0.73	0.80	-0.71	0.78	-0.69
Operating costs: +15% for non-green properties		-0.09		-0.13		-0.12		-0.09
Vacancy: 5% higher for non-green properties		-0.29		-0.34		-0.37		-0.38
Difference with base case scenario	1.35	-1.61	1.33	-1.69	1.30	-1.70	1.27	-1.66
Outperformance of green properties	**2.96**		**3.02**		**3.00**		**2.93**	
Scenario 2: Improving the energy label to a green label								
2) Effect on the IRR of cost of improving the energy label to C		-0.24		-0.38		-0.78		-1.18
Outperformance of green properties	**0.24**		**0.38**		**0.78**		**1.18**	
Scenario 3 energy costs affect the rents								
3) Effect on the IRR when energy costs have an effect on the rent	0.12	-0.19	0.17	-0.25	0.32	-0.48	0.46	-0.70
Outperformance of green properties	**0.31**		**0.42**		**0.80**		**1.16**	
Scenario 4: A CO_2 tax is introduced								
4) Effect on the IRR of a CO_2-tax, as high as the WOZ-tax	0.18	-0.19	0.18	-0.19	0.18	-0.18	0.19	-0.18
Outperformance of green properties	**0.36**		**0.36**		**0.36**		**0.37**	
Scenario 5: sustainability is taken into account in selection decisions								
5) Effect on the IRR	Depends on the vacany level, low impact for high demand location, high impact for low demand locations							
Outperformance of green properties	**At low demand locations, green properties are expected to be selected earlier**							

Figure 7.9: overview of the effects on the IRR of several scenarios

In general, the sustainability level can have a large impact on the investment returns. When in scenario 1 the found differences between green and non-green office properties are applied to retail properties, green properties have an average return that is 3.0% higher than non-green properties.

However, the findings in the office sector cannot be easily copied to the retail sector. The rents for retail properties are on average (much) higher than for office properties and the vacancy level is (much) lower. The properties with the lowest rents and values are the most vulnerable when energy efficiency is taken into account. This can especially be seen for the peripheral large retail properties and the neighborhood centers.

The effect on the IRR of the required investment to improve an energy label of a property is relatively small for high street retail properties (with the highest rents) and relatively large for peripheral large retail properties (with the lowest rents). This is also true for rent when energy efficiency is taken into account in rent calculations: the effect on the IRR will then be relatively large for peripheral large retail properties and relatively small for high street properties. The effect of the energy costs is about equal to the effect of improving the energy label, and it would therefore make an upgrade financially neutral compared to accepting a lower rent. However, this is only true when the difference in energy costs is taken into account in rent calculations and is not combined with a higher (exit) yield.

An CO_2 tax will have the same effect on the IRR for all types of retail properties. Since the high street properties have the lowest expected IRRs, the impact of a CO_2 tax will be highest on non-green high street retail properties. When the CO2 tax is based on the energy label of a property (which is recommended by the UN, 2009), green properties will always outperform the non-green properties.

The location within the retail area is a major factor that affects the demand for the retail property and therefore also the vacancy level, rent, value and return. The specific location is expected to amplify the effect that the sustainability level has on the performance of the property, with a low impact on good locations with a high demand and a potential high impact on locations with a lower demand and higher vacancy.

Chapter 8: Conclusions, management advice and recommendations

This chapter will answer the main question of this study:

Is there a relation between sustainability and outperformance of a retail property investment portfolio?

The conclusions of this study will be presented in paragraph 8.1. Management advice will be provided in paragraph 8.2. In paragraph 8.3, the results will be discussed in relation to earlier studies and 8.4, recommendations for further research will be provided.

8.1 Conclusions

The historical analysis is based on the rents and values as of 31-12-2011 and the total and income return, operating costs and the average vacancy over the period 2007-2011. The main conclusion is:

There is no evidence of a statistical relation between sustainability and outperformance of a retail portfolio

The results from this research show that green properties have a significant higher direct income return and counterintuitive, non-green properties have significant higher rents and values. However, when this is explored further in a regression analysis, the study shows that the significant differences are not caused by the energy labels, but by other factors influencing the performance of a retail property. The total return, vacancy rate and operating costs also had no significant relation to the sustainability level of a property.

Since the energy index is significantly positively related to the age and size of the entire center, this means non-green properties are generally older and more prevalent in the larger centers. These larger centers also have higher rents, values and lower income returns. In addition, non-green properties are smaller and have smaller retail units than green properties, enhancing the rent and values. Therefore, the significant difference in rent, value and income return of green and non-green properties is not caused by the energy label, but by the size and catchment area of the (city) center, the location and the size of the property.

In the longer term, the conclusion for the **expected future situation** can be summarized as:

Sustainable portfolios have the opportunity to outperform, non-sustainable portfolios the risk to underperform

The analyzed scenarios show that when sustainability is taken into account in acquisition, leasing and selection decision, not sustainable properties have potentially higher (improvement) costs and lower (rental or sales) income. The potential effects on the (out)performance vary by the type of retail: the performance of a high street retail property or shopping center with a G label is affected less in the scenarios than a neighborhood center or peripheral large retail property. Furthermore, the effects of the scenarios for the retail sector are in general smaller than the findings from the office and residential sector. Nevertheless, in all scenarios the green properties outperform the non-green properties.

The combination of the two conclusions above, leads to a remarkable situation: although non-green properties have a higher risk profile and green properties have the opportunity to outperform, no significant difference in sales prices can be seen. And while it is widely known that properties with a non-green energy label have higher energy costs than properties with a green label, this has currently no effect on the rental levels of retail properties. This can be caused by the situation that investors or tenants might not oversee the effects on their housing costs or investment return yet, and therefore might not price the sustainability level (correctly). Another reason could be that investors or tenants do not believe in the potential effects of sustainability.

Therefore, the observations above lead to the following conclusion:

The market does not function efficiently regarding sustainability or actors do not believe its future effects (yet)

This creates an opportunity for a portfolio manager to lower the risk of the portfolio and position the portfolio for potential future outperformance, without (large) extra costs.

8.2 Strategic management advice

➢ *Measuring the sustainability level of the portfolio creates opportunities and decreases risks*

In the longer term, the scenario analysis shows that non-green properties have a higher risk of underperformance and that green properties can create an outperformance when the energy label is taken into account in the leasing and acquisition decisions. A large share of non-green properties implies a risk for higher improvement costs, lower rents, lower values and higher vacancy levels. A portfolio with a large share of green properties has a lower risk and is better positioned when the energy label is taken into account in leasing and acquisition decisions. Therefore, measurement of the sustainability level is important to assess the risk profile and future (out)performance of a property portfolio.

➢ *Improve the sustainability level of the portfolio by a smart acquisition, maintenance and sales policy*

As the sustainability level does not impact the rent or value of a property, non-green properties can currently be sold without a discount and green properties can be acquired without a premium. This gives portfolio managers the opportunity to decrease their portfolio risk by acquisitions of sustainable properties without a premium and by disposing of non-sustainable properties without a discount. By involving sustainability criteria in the acquisition due diligence and by calculating the necessary improvement costs, these costs can be translated into a discount or a more refined return forecast. By integrating the improvements into the regular maintenance, the costs and the effect on the IRR will be less than by solely improving the sustainability level.

➢ *Make only major sustainability investments if this is directly rewarded*

Outperformance is created primarily by a higher return than the benchmark. This research has shown that investments in sustainability do not lead to higher rents, values or returns in the short term. Therefore, large investments in order to increase the sustainability level of the portfolio do not lead to value creation (even lead to the opposite) when they do not lead to a higher price paid by the tenant or (future) purchaser.

➢ *Integrate the competitiveness of a property into the decision making process*

The magnitude of the future effects of sustainability on a specific retail property are expected to be highly dependent on the demand and the competitiveness of a property. In locations with a very high demand and very low vacancy, retailers will have few properties to choose from and the opportunity for retailers to negotiate a lower rent will be much less. In locations with less demand and high vacancy levels, the opportunity exist for retailers to negotiate a discount. Since the vacancy level mainly depends on the location of the property within a center, the properties with the best location are expected to be affected least. In order to do a sustainable investment, the 'profit' aspect needs to be covered too.

➢ *Focus also on other sustainability criteria such as location, accessibility, materials and attractiveness*

The energy label covers only one element (energy) of the diverse range of sustainability elements (compared with for instance the BREEAM label that covers 9 categories). The properties with non-green energy labels are generally older, but have the highest rents and values. This means that they might be more sustainable on material usage than properties which are built for a lifetime of 50 years. Their location in the larger (city) centers usually affords them (very) good accessibility by public transport, which means they score high on the transport element of sustainability. Their attractiveness and appreciation by retailers and consumers means they also score high on the 'people' element of sustainability.

For retail, the location of the property and the amount of people passing by the unit is of utmost importance. The total return of retail properties is determined most by the change in rental income and the change in the vacancy, as the regression analysis of the total returns shows. Therefore, it will remain important for portfolio managers to focus on keeping vacancy levels low and to benefit from opportunities to increase the rent.

8.3 Discussion in relation to earlier studies

The conclusion of this historical analysis that sustainability has no significant effect on the rents and values runs contrary to the conclusions of the studies on the office and residential sectors, which all find higher rents and values for sustainable properties. However, the more detailed the study is and the more refined the regression analysis method is, the smaller the difference between the green and non-green properties is. This can also be seen in this study. Initially, a significant difference has been found, but after a thorough regression analysis, the difference is found to originate from other factors than the sustainability level of the property. Another explanation might be that sustainability has been incorporated more within the office and residential sectors than in the retail sector, since the location and the presence of consumers are far more important for the income and profit of the retailer than the energy costs of the unit.

The finding of this study that the sustainability level has no significant influence on the return is in line with other studies on the returns of sustainable (non-retail) funds, as shown by Van den Broek (2010), Makaaij (2011) and Eichholtz, Kok & Yonder (2012). Larger studies on the relation between sustainability or corporate social responsibility (CSR) and the returns of investment funds in general indicate mixed results. Many review studies find no significant relation between sustainability and performance, and Orlitzky (2003) finds in his large meta-analysis only a small positive correlation between sustainability and financial performance.

The result of this study that retail properties have higher rents, higher values and lower vacancy levels in larger centers is fully in line with the general retail theories of Christaller, Alonso, Reilly, Nelson and Myrdal and with the published articles. The fact that age was no determinant for rents and values is the only aspect that is not consistent, but since the earlier studies were on shopping centers, the situation might be different for high street retail properties. Shopping centers may have a lower rent when they are older.

8.4 Recommendations for further research

This study focuses solely on energy labels. As mentioned in the management advice section, sustainability covers a broader spectrum, more than energy alone. Additional research is therefore recommended that focuses on broader sustainability labels, such as BREEAM in Use or LEED, the moment they become available.
This is the first study exploring the effects of sustainability on the returns of retail properties. No studies on the returns of sustainable office properties have been published yet. For investors, the return effect is most important and therefore more research on the returns of green (office) properties is recommended.

Further research is also recommended with a specific focus on the building quality of the property. Studies show that the building quality has an effect on the rent, for office as well as retail properties. However, building quality for offices in mostly measured in A, B and C classes, but there is a lot of differences in building quality within these classes. A segmentation for retail does not even exist. As a result, current studies do not incorporate the building quality fully. Therefore, a part of the premium that is now assigned to the sustainability level could also be due to a higher building quality.

The location is also a very important driver of rents, values and yields. Current studies compare buildings with each other within certain location ranges, with the study by Eichholtz, Kok & Quiqley (2011) being the most accurate within a range of 0.2 square mile (700 x 700 meter). However, a small difference in location can make a large difference in performance. A part of the sustainability premium could also be due to a better location. Therefore, further research is recommended to study comparisons within an even smaller location range.

When deciding to invest in order to increase the sustainability level of properties, it is important to have evidence of rental, value and return growth after an upgrade to a more sustainable level has been implemented. More research is therefore recommended on a (large) number of known sustainability improvements and their effects on rents, values and returns.

Bibliography

AgentschapNL. (2011). *Energiecijfers Energie & Gebouwde Omgeving*. Retrieved 04 29, 2012, from www.energiecijfers.nl

AgentschapNL. (2011). Energieprijs module. Den Haag, Nederland.

Anderson, P. (1985). Association of Shopping Center Anchors with Performance of a Non-Anchor Specialty Chain's Stores. *Journal of Retailing , 61* (2), 61-74.

Aroul, R. & Hansz, J. (2012). The Value of "Green": Evidence from the First Mandatory Residential Green Building Program. *Journal of Real Estate Research , 34* (1), 27-49.

ASRE. (2011). Benchmarking. *Presentation sheets dr. M. Theebe for the MRE Real Estate Finance course.* Amsterdam: Amsterdam School of Real Estate.

ASRE. (2012). Is mijn respons (dataset) representatief. *Presentation sheets dr. M. Theebe.* Amsterdam: Amsterdam School of Real Estate.

Atkisson, A. (1999). *Believing Cassandra: How to be an Optimist in a Pessimist's World.* Vancouver: Routledge.

Atzema, O. (2009). Ruimtelijke Economische Dynamiek. Bussum: Coutinho.

Baarda, B., De Goede, M. & Van Dijkum, C. (2011). Basisboek Statistiek met SPSS. Groningen: Noordhoff Uitgevers bv.

Baum, A. (2009). Commercial Real Estate Investment, a Strategic Approach. London: Elsevier.

Bolt, E. (1995). *Produktvorming in de detailhandel.* Merkelbeek: Drukkerij Bakker Merkelbeek.

Bolt, E. (2003). Winkelvoorzieningen op waarde geschat. In E. Bolt, *Winkelvoorzieningen op waarde geschat* (p. 147). Merkelbeek: Drukkerij Bakker Merkelbeek.

BRE. (2008). *A discussion document comparing international environmental assessment methods for buildings.* Watford, UK: BRE.

BRE. (2011). *BREEAM*. Retrieved 04 10, 2012, from www.breeam.org

Brounen, D. & Kok, N. (2011). On the economics of energy labels in the housing market. *Journal of Environmental Economics and Management* (62), 166-179.

Brown, G. & Matysiak, G. (2000). eal estate investment : a capital market approach. London: Financial Times, Prentice Hall.

CBRE. (2012). *CBRE Dutch Retail Fund, Annual Report 2011.* The Hague: CBRE Global Investors.

Chegut, A., Eichholtz, P. & Kok, N. (2011). *Supply, Demand, and the Value of Green Buildings.* Maastricht: Maastricht University.

Des Rosiers, F., Theriault, M., & Lavoie, C. (2009). Retail Concentration and Shopping Center Rents - A Comparison of Two Cities. *Journal of Real Estate Research , 31* (2), 165-207.

Des Rosiers, F., Theriault, M., & Menetrier, L. (2005). Spatial Versus Non-Spatial Determinants of Shopping Center Rents: Modeling Location and Neighborhood-Related Factors. *Journal of Real Estate Research , 27* (3), 293-318.

DTZ Zadelhoff. (2010, 12). Duurzame, energiezuinige kantoren zijn meer waard. *Vastgoedmarkt* , 59.

Eichholtz, P., Kok, N. & Quigley, J. (2010). Doing Well by Doing Good: Green Office Buildings. *American Economic Review , 100* (5), 2494–2511.

Eichholtz, P., Kok, N. & Quigley, J. (2011). The Economics of Green Building. *Working Paper No. W10-003.* Berkeley: University of California.

Eichholtz, P., Kok, N. & Yonder, E. (2011). *Portfolio Greenness and the Financial Performance of REITs.* Research Paper, Maastricht.

Elkington, J. (1997). *Cannibals with Forks: the Triple Bottom Line of 21st Century Business.* North Mankato, US: Capstone Publishing .

Enkvist, P.-A., Naucler, T. & Rosander, J. (2007). A Cost Curve for Green House Reduction. *The McKinsey Quarterly , 1*, 35-45.

EPA, U. (2012, 04 10). Retrieved 04 10, 2012, from Energy Star: www.energystar.gov

Eppli, M. (1998, April). Value Allocation in Regional Shopping Centers. *The Appraisal Journal* , 199-206.

Eppli, M. & Benjamin, J. (1994). The Evolution of Shopping Center Research: A Review and Analysis. *Journal of Real Estate Research , 9* (1), 5-32.

Eppli, M. & Shilling, J. (1996). How Critical Is a Good Location to Regional Shopping Center? *Journal of Real Estate Research , 12* (3), 459-468.

Eppli, M. & Shilling, J. (1995). Large-Scale Shopping Center Development Opportunities. *Land Economics , 71* (1), 35-41.

Eppli, M. Shilling, J., & Vandell, K. (1998). What Moves Retail Property Returns at the Metropolitan Level. *Journal of Real Estate Finance and Economics , 16* (3), 317-342.

Eurostat. (2009). *Consumers in Europe.* Luxembourg: European Union.

Field, A. (2005). Discovering Statistics Using SPSS. London. Thousend Oaks, New Delhi: SAGE Publications.

Finn, A. & Louviere, J. (1996). Shopping Centere Image, Consideration and Choice: Anchor Store Contribution. *Journal of Business Research , 35* (3), 241-251.

FoodProductDesign. (2011, June 8). *FoodProductDesign.* Retrieved November 13, 2011, from FoodProductDesign: www.foodproductdesign.com

Fuerst, F. & McAllister, P. (2009). An Investigation of the Effect of Eco-labeling on Office Occupancy Rates. *Journal of Sustainable Real Estate* (1), 49-63.

Fuerst, F. & McAllister, P. (2011). Green Noice or Green Value? Measuring the Effects of Environmental Certification on Office Values. *Real Estate Economics , 39* (1), 45-69.

Gatzlaff, D., Sirmans, G. & Diskin, B. (1994). The Effect of Anchor Tenant Loss on Shopping Center Rents. *Journal of Real Estate Research , 9* (1), 99-110.

Geltner, D. & Miller, N. (2007). Commercial Real Estate Analysis & Investments. Mason, Ohio, USA: South-Western Cengage Learning.

Goldman Sachs & Russel. (2003). *Report on Alternative Investing by Tax-Exempt Organizations 2003.* New York and Tacoma: Goldman Sachs International & Russel Investment Group.

Griffin, J. & Mahon, J. (1997). The corporate social performance and corporate financial debate: Twenty-five years of incomparable research. *Business & Society* (36), 5-31.

Hardin, W. & Wolverton, M. (2000). Micro-Market Determinants of Neighborhood Center Rental Rates. *Journal of Real Estate Research , 20* (3), 299-322.

Hardin, W. & Wolverton, M. (2001). Neighborhood Center Image and Rents. *Journal of Real Estate Finance and Economics , 23* (1), 31-46.

H&M. (2012). *Annual Report 2011,* Retrieved August 19, 2012, from: www.hm.com

Herman De Groot. (2009). *Vergelijkingen duurzaamheidslabels.*

Ingene, C. & Lusch, R. (1980). Maket Selection Decisions for Department Stores. *Journal of Retailing , 56* (3), 21-40.

Ingene, C. & Yu, E. (1981). Determinants of Retail Sales in SMSAs. *Regional Science and Urban Economics , 11* (4), 529-547.

INREV. (2010). *Sustainability Report.* Amsterdam: INREV.

Inditex. (2012). *Annual Report 2011,* Retrieved August 19, 2012, from: www.inditex.com

IPCC. (2007). *Climate Change 2007: The Physical Science Basis.* Cambridge: Cambridge University Press.

IPD. (2012). *Corporate Brochure.* London: Investment Property Databank.

IPD. (2012). *Dutch Retail Fund Direct and Indirect Benchmark Report.* Almere / London: Investment Property Databank.

IPD. (2011). *Several European Real Estate Indices.* London: IPD.

IVBN. (2009). *Visie op duurzaam vastgoed.* Voorburg: IVBN.

Kok, N. & Jennen, M. (2011). *The value of energy labels in the European office market.* Maastricht, Rotterdam: Maastrict University and RSM Erasmus.

Kahn, M. & Kok, N. (2012). *The Value of Green Labels in the California Housing Market.* Berkeley / Los Angeles: University of California.

Koot, R. (2007, april). Huurprijsniveau planmatige wijkwinkelcentra beter in kaart gebracht. *Property NL Research Quarterly* , 7-12.

Koot, R. (2006). *Welke factoren hebben invloed op het huurniveau in planmatige wijkwinkelcentra in Nederland?* Amsterdam: Universiteit van Amsterdam.

Lillis, C. & Hawkins, D. (1974). Retail Expenditure Flows in Continuous Trade Areas. *Journal of Retailing , 50* (2), 31-42.

Liu, B. (1970). Determinants of Retail Sales in Metropolitan Areas: 1954 and 1963. *Journal of the American Statistical Association , 65* (332), 1460-73.

Locatus. (2012). *Retail Facts 2012.* Woerden: Locatus.

Mackaaij, R. (2011). *Europese vastgoedfondsen en de relatie tussen duurzaamheid en financiele prestaties.* Groningen: Rijksuniversiteit.

Margolis, J. & Walsh, J. (2001). *People and profits? The search for a link between a company's social and financial performance.* Erlbaum, NJ: Mahwah.

Meadows, D. e. (1972). *The Limits to Growth.* St. Gallen: Club of Rome.

Mejia, L. & Benjamin, J. (2002). What Do We Know About the Determinants of Shopping Center Sales? Spatial vs. Non-Spatial Factors. *Journal of Real Estate Literature , 10* (1), 3-26.

Mejia, L. & Eppli, M. (2003). Inter-Center Retail Externalities. *Journal of Real Estate Finance and Economics , 27* (3), 321-333.

Mejia, L. & Eppli, M. (1999). The Effect of Merchandise Space Allocation to Retail Sales in Enclosed Shopping Centers. *Journal of Shopping Center Research , 6* (2), 23-40.

Miller, N. (2010). *Does Green Still Pay Off?* Retrieved 11 21, 2011, from Journal of Sustainable Real Estate: www.josre.org

Miller, N., Spivey, J. & Florance, A. (2008). Does Green Pay Off? *Journal of Real Estate Portfolio Management, 14* (4).

Mols, B. (2006). *Hoe kun je appels met peren vergelijken?* Amsterdam School of Real Estate. Amsterdam: Amsterdam School of Real Estate.

Orlitzky, M., Schmidt, F. & Rynes, S. (2003). Corporate Social and Financial Performance: A Meta-analysis Marc Orlitzky. *Organization Studies , 24* (3), 403-441.

Ownbey, K., Davis, K. & Sundel, H. (1994). The Effect of Location Variables on the Gross Rents of Neighborhood Shopping Centers. *Journal of Real Estate Research , 9* (1), 111-123.

Pot. (2009). *Duurzame kantoorgebouwen: een studie naar het rendement voor de belegger.* Amsterdam: Amsterdam School of Real Estate.

Reed, R., Bilos, A., Wilkinson, S. & Schulte, K.-W. (2009). International Comparison of Sustainable Rating Tools. *Journal of Sustainable Real Estate , 1* (1), 1-22.

Reichhadt, A., Fuerst, F., Rottke, N. & Zietz, J. (2012). Sustainable Building Certification and the Rent Premium: A Panel Data Approach. *Journal of Real Estate Research , 34* (1), 99-126.

Russell, V. (1957). The relationship between Income and Retail Sales in Local Areas. *Journal of Marketing , 21*, 329-332.

SCN. (2012). Waardering verkoopruimte op verdieping. *Shopping Center News* (2), 17-21.

Sirmans, C. & Guidry, K. (1993). The Determinants of Shopping Center Rents. *Journal of Real Estate Research , 8* (1), 107-115.

Speentjes, J. & Van der Steen, A. (1998). *Huurprijsvorming in planmatig ontwikkelde winkelcentra - Naar een betere vaststellingsmethodiek.* Amsterdam: SBV.

Tay, R., Lau, C. & Leung, M. (1999). The Determination of Rent in Shopping Centers: Some Evidence from Hong Kong. *Journal of Real Estate Literature , 7*, 183-196.

UN. (1987). *Report of the World Commission on Environment and Development.* Oslo: United Nations.

UNEP. (2009). *Buildings and Climate Change.* Parijs: United Nations Environmental Programme.

USGBC. (2012, 04 09). *United States Green Building Council*. Retrieved 04 09, 2012, from www.usgbc.org

Van den Broek, J. (2010). *Groen licht voor duurzame kantoren?* Amsterdam: Amsterdam School of Real Estate.

Van Driel, A. (2003). Strategisch inzet van vastgoed. In A. Van Driel, *Strategisch inzet van vastgoed* (p. 42). Nieuwegein: Arko Uitgeverij.

Van Wetten, P. (1996). Inleiding waarderingsmodellen. In G. Vos, & L. Uittenboogaard, *Waardebepaling Vastgoed* (p. 116). Amsterdam: Stichting voor Beleggings- en Vastgoedkunde.

Volkskrant. (2011, October 13). *Australie heft belasting op CO2 uitstoot.* Retrieved November 13, 2011, from Volkskrant: www.volkskrant.nl

Waddock, S. (1997). The Corporate Social Performance - Financial Performance Link. *Strategic Management Journal , 18* (4), 303-319.

Wiley, J., Benefield, J. & Johnson, K. (2010). Green Design and the Market for Commercial Office Design. *Journal of Real Estate Finance and Economics , 41* (2), 228-243.

Zandbergen, G. (2012, 01 24). *Winkelmarkt anno 2012*. Retrieved 04 08, 2012, from Locatus: www.locatus.com/retailreflect/2012/24/01/winkelmarkt-anno-2012/

Appendix A.1 Descriptive statistics of the research sample

Descriptive statistics	N	Mean	Median	SD	Minimum	Maximum	Skewness	Kurtosis
Performance drivers								
Total return '07-'11 (%)	96	7.71	7.61	2.15	.06	15.29	-.07	2.20
Outperformance Total Return (%)	96	.00	-.10	2.15	-7.65	7.58	-.07	2.20
Income Return '07-'11 (%)	97	6.04	5.96	.69	4.07	8.01	-.20	.55
Outperformance Income Return (%)	97	.00	-.08	.69	-1.97	1.96	-.20	.55
Value per adjusted m2 (EUR)	121	€ 5521	€ 3884	€ 4333	€ 960	€ 22961	1.71	2.99
ln (value per adj m2)	121	8.36	8.26	.71	6.87	10.04	.22	-.54
Rent per adjusted m2 (EUR)	122	€ 345	€ 255	€ 222	€ 73	€ 995	1.17	.69
ln (rent per adj m2)	122	5.65	5.54	.62	4.29	6.90	.10	-.73
Average operating costs '07-'11 (%)	98	10.62	9.65	4.40	2.35	28.03	1.15	1.95
Average vacancy '07-'11 (%)	99	.76	.00	1.88	.00	13.06	4.50	24.66
Correction factors								
Age (years)	124	39.09	26.50	32.07	2.00	192.00	1.78	4.02
ln (age)	124	3.67	3.28	.84	.69	5.26	-.45	.44
adjusted property size (m2)	124	4057	1991	5367	57	27009	2.20	5.37
ln (adjusted property size)	124	8.31	7.60	1.56	4.05	10.20	-.27	-.90
average m2 per lease	124	1040	331	2007	25	13407	4.26	20.65
ln (average m2 per lease)	124	6.95	5.80	1.17	3.20	9.50	.68	.50
Catchment area (inhabitants)	124	172,550	137,541	187,864	4,031	908,125	2.44	6.30
ln (Catchment area)	124	12.06	11.83	1.02	8.30	13.72	-.26	.09
Size total center (m2)	124	48,654	34,163	51,693	1,303	258,969	2.16	5.64
ln (Size of the total center)	124	10.79	10.44	1.24	7.17	12.46	-.54	-.47
Increase in vacancy 07-11 (%)	99	.94	.00	3.01	-3.60	17.40	4.17	19.31
Increase in rent 07-11 (%)	96	8.63	7.46	9.03	-18.94	38.14	.36	2.51

Tests of Normality	Kolmogorov-Smirnov[a]		
	Statistic	df	Sig.
Correction factors			
Total return of '07-'11	0.086	96	.075
Outperformance Total Return	0.086	96	.075
Income Return '07-'11	0.066	97	.200*
Outperformance Income Return	0.066	97	.200*
Value per adjusted m2	0.162	121	.000
ln (value per adj m2)	0.064	121	.200*
Rent per adjusted m2	0.169	122	.000
ln (rent per adj m2)	0.079	122	.062
Average operating costs '07-'11	0.119	98	.002
Average vacancy '07-'11	0.343	99	.000
Correction factors			
Age	0.159	124	.000
ln (age)	0.083	124	.034
adjusted total size (m2)	0.228	124	.000
ln (adjusted property size)	0.074	124	.095
average m2 per lease	0.306	124	.000
ln (average m2 per lease)	0.162	124	.000
Catchment area	0.223	124	.000
ln (Catchment area)	0.134	124	.000
Size total center (m2)	0.184	124	.000
ln (Size of the total center)	0.145	124	.000
Increase in vacancy 07-11	0.411	99	.000
Increase in rent 07-11	0.224	96	.000

Appendix A.2 Excluded data

All the retail 'standing' investments have been included in the analysis. For the total return, income return, vacancy and operating cost analysis over the period 2007-2011, the properties that were acquired, sold or redeveloped in that period have been excluded from the analysis. This has resulted in the exclusion of the following properties from the analysis of the 4 variables stated above:

Excluded properties for total return, income return, vacancy costs and operating costs analysis

PR8406	PR9212	PR9269	PR9309	PR9514	PR9911	PR9996
PR9022	PR9258	PR9277	PR9326	PR9516	PR9931	
PR9029	PR9259	PR9287	PR9509	PR9517	PR9989	
PR9125	PR9268	PR9308	PR9513	PR9775	PR9993	

Furthermore, the following outliers have been excluded for specific variables, since they transformed the outcome of the regression analysis too much:

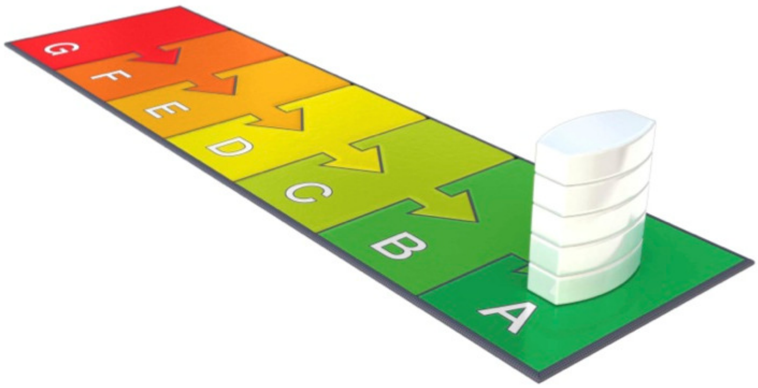
Excluded outliers	Variables
PR8425	Value, rent, income return, total return, vacancy, operating costs
PR8429	Total return
PR9023	Increase in rent, direct income return
PR9899	Total return, income return, operating costs,
PR9939	Total return, income return, operating costs, vacancy, value

Appendix B: the energy label

Energielabel gebouw

Afgegeven conform de Regeling energieprestatie gebouwen.

Veel besparingsmogelijkheden



Weinig besparingsmogelijkheden

A

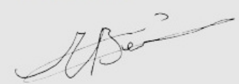
(zie toelichting in bijlage)

Dit gebouw

Labelklasse maakt vergelijking met gebouwen met overeenkomstige samenstelling mogelijk

Winkel

Winkelfunctie *(zie de bijlage voor de samenstelling)*

Gebruiksoppervlakte	**Adviesbedrijf**
250 m²	INNAX installatieadviseurs
Opnamedatum	**Inschrijfnummer**
24 april 2012	080100363
Energielabel geldig tot	**Handtekening**
24 april 2022	
Afmeldnummer	
493825149	

Straat
Diepswal
Nummer/toevoeging
13
Postcode
9679 AM
Plaats
Scheemda

Energielabel op basis van een ander representatief gebouw of gebouwdeel? *Nee*

Adres representatief gebouw of gebouwdeel:

Standaard energiegebruik voor dit gebouw

Energiegebruik per viekante meter maakt vergelijking met andere gebouwen mogelijk

- Het standaard energiegebruik wordt uitgedrukt in de eenheid 'megajoules' per vierkante meter gebruiksoppervlakte (MJ/m²), dit is gebaseerd op elektriciteit (kWh/m²), gas (m³/m²) en warmte (GJ/m²).
- De CO2-emmissie als gevolg van het standaard energiegebruik wordt uitgedrukt in kilogram per vierkante meter gebruiksoppervlakte (kg/m²)
- Bij de berekening wordt uitgegaan van het gemiddelde Nederlandse klimaat, een gemiddelde bezettingsgraad van het gebouw en een gemiddeld gebruikersgedrag.
- Het standaard energiegebruik van dit gebouw is de hoeveelheid energie die jaarlijks nodig is voor verwarming, gebouwkoeling, de productie van warm tapwater, ventilatie en verlichting (exclusief de apparatuur die geen deel uitmaakt van de klimaat- en verlichtingsinstallaties).

772 MJ/m²
(megajoules)

43 kg/m²
(CO2-emissie)

39 kWh/m² (elektriciteit)
12 m³/m² (gas)
0 GJ/m² (warmte)

Appendix B: the energy label (continued)

BIJLAGE

Toelichting gebruiksoppervlakte

De gebruiksoppervlakte is dat deel van de vloeroppervlakte dat direct gericht is op het gebruik van het gebouw of van afzonderlijke delen van het gebouw. De niet-dragende binnenwanden spelen bij de bepaling geen rol. De oppervlakte zal afwijken van Bruto vloeroppervlakte (BVO), Netto vloeroppervlak (NVO) en Verhuurbare Vloeroppervlakte (VVO). De volledige definitie voor de bepaling van de oppervlakte is vastgelegd in de NEN 2580

Een gebouw kan één of meerdere gebruiksfuncties hebben. De volgende gebruiksfuncties kunnen voorkomen: bijeenkomstgebouw-, celgebouw-, gezondheidsgebouw- (klinisch of niet-klinisch), kantoor-, logiesgebouw, onderwijsgebouw-, sportgebouw- en winkelfunctie

Dit gebouw heeft de volgende samenstelling aan gebruiksfuncties.

Samenstelling/functie	Percentage
Winkelfunctie	100%

Energie-index

Voor dit gebouw wordt een energie-index berekend. Deze bepaalt in welke labelklasse dit gebouw valt. De letter hieronder geeft de labelklasse aan. Het getal geeft de energie-index van dit gebouw aan. De energie-index wordt berekend op basis van de bouwkundige eigenschappen en gebouwgebonden installaties. De berekening gaat uit van een gemiddeld Nederlands klimaat, een gemiddelde bezettingsgraad van het gebouw en gemiddeld gebruikersgedrag.

A++	A+	A	B	C	D	E	F	G
≤ 0,50	0,51 - 0,70	0,71 - 1,05	1,06 - 1,15	1,16 - 1,30	1,31 - 1,45	1,46 - 1,60	1,61 - 1,75	> 1,75

A 0.73

(energie-index)

Disclaimer

De maatregelen die genoemd worden op dit energielabel zijn maatregelen die op dit moment in de meeste gevallen kosteneffectief zijn of dit binnen de geldigheidsduur van het energielabel kunnen worden. Of de genoemde maatregelen daadwerkelijk verantwoord toegepast kunnen worden uit oogpunt van bijvoorbeeld binnenmilieu, comfort, technische mogelijkheden, gezondheid, kosteneffectiviteit en dergelijke is afhankelijk van de huidige specifieke eigenschappen van dit gebouw. U kunt hierover nader advies inwinnen door bijvoorbeeld een maatwerkadvies.

Het energielabel geeft inzicht in het gestandaardiseerd gebouwgebonden primaire energiegebruik en niet in het daadwerkelijke energiegebruik van de gebruikers van dit gebouw. Daarom komt het jaarlijkse energiegebruik op het energielabel wellicht niet overeen met de informatie op de jaarlijkse energierekening van dit gebouw.

Alleen een volledig ingevuld energielabel is rechtsgeldig.

Appendix C: The base case 10-years IRR model (example: for a neighborhood center)

IRR calculation model - base case

Key investment characteristics:

type of investment:	purchase price: € 14121577	total investment:	€ 14121577	**Initial Gross Yield: excl. acq. costs**	**7.15%**
project name:	Purchase costs 0	average growth of value:	1.31%	**Initial Gross Yield: incl. acq. costs**	**7.15%**
address:	total investment: € 14121577	average growth of lease income:	2.00%	**Net Yield excl AM:**	**6.31%**
place:		exit gross yield:	7.15%	**IRR excl AM:**	**7.80%**
type of real estate:		Net selling price	€ 16089946		
description:					

Exploitation-report	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	2023
theoretical income												
rent		€ 1009817	€ 1030013	€ 1050614	€ 1071626	€ 1093058	€ 1114920	€ 1137218	€ 1159962	€ 1183162	€ 1206825	€ 1230961
other income		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
gross income		€ 1009817	€ 1030013	€ 1050614	€ 1071626	€ 1093058	€ 1114920	€ 1137218	€ 1159962	€ 1183162	€ 1206825	€ 1230961
Income expenses												
vacancy		€ 10704	€ 10918	€ 11137	€ 11359	€ 11586	€ 11818	€ 12055	€ 12296	€ 12542	€ 12792	€ 13048
leasing costs		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
write-off rent		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
total income expenses		€ 10704	€ 10918	€ 11137	€ 11359	€ 11586	€ 11818	€ 12055	€ 12296	€ 12542	€ 12792	€ 13048
exploitation expenses												
total maintenance		€ 30295	€ 30900	€ 31518	€ 32149	€ 32792	€ 33448	€ 34117	€ 34799	€ 35495	€ 36205	
total costs of promotion		€ 10098	€ 10300	€ 10506	€ 10716	€ 10931	€ 11149	€ 11372	€ 11600	€ 11832	€ 12068	
total management fee		€ 26558	€ 27089	€ 27631	€ 28184	€ 28747	€ 29322	€ 29909	€ 30507	€ 31117	€ 31739	
total various costs		€ 20196	€ 20600	€ 21012	€ 21433	€ 21861	€ 22298	€ 22744	€ 23199	€ 23663	€ 24136	
total fixed expenses		€ 20196	€ 20600	€ 21012	€ 21433	€ 21861	€ 22298	€ 22744	€ 23199	€ 23663	€ 24136	
total exploitation expenses		€ 107344	€ 109490	€ 111680	€ 113914	€ 116192	€ 118516	€ 120886	€ 123304	€ 125770	€ 128285	
net operating income		€ 891769	€ 909605	€ 927797	€ 946353	€ 965280	€ 984585	€ 1004277	€ 1024363	€ 1044850	€ 1065747	
investments												
disinvestments												
Cash flow and IRR	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**IRR**
cash flow	-€14121577	€ 891769	€ 909605	€ 927797	€ 946353	€ 965280	€ 984585	€ 1004277	€ 1024363	€ 1044850	€ 17155693	**7.80%**

Appendix C: The base case 10-years IRR model (continued)

IRR model - main characteristics - example: neighborhood center

General info:	
First year of exploitation	2013
asset management fee	0
size of the property (m2)	5287

Rent:	
starting rent per m2	191
Total starting rent year 0	1009817
other income	0
yearly inflation	2.00%
yearly rent increase	2.00%

Purchase and sales price:	
Gross Initial Yield purchase	7.15%
Purchase price excl. purchase costs	€14121577
Purchase costs	0.00%
Total investment	€14121577
Exit Gross Initial Yield	7.15%
Purchaser's costs exit	7%

Exploitation costs:	
Exploitation costs - maintenance	3.00%
Exploitation costs - promotion	1.00%
Exploitation costs - property management	2.63%
Exploitation costs - fixed expenses	2.00%
Exploitation costs - other expenses	2.00%
Exploitation costs - total	10.63%
Corrective maintenance in year 1	€ -

Income expenses	
Vacancy per year	1.06%
Marketing and leasing costs as % of vacancy	0%
Initial vacancy in year 1	€ -
write off rent per year	0.00%