

# **Effect of sustainability on the value of new dwellings and land**

*A hedonic price analysis combined with qualitative research to determine the effects of sustainable measures on the value of new dwellings and land*

## **Colophon**

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## **Summary**

Sustainability is becoming an increasingly common and important concept, also in the real estate world. This is mainly due to the large amount of CO<sub>2</sub> emissions of which 40% is caused by the real estate world. To reduce these CO<sub>2</sub> emissions, measures and objectives are adopted by governments. A legally established measure in the Netherlands is BENG (Almost Energy Neutral Buildings). BENG replaces the current EPC standards and consists of three indicators. These indicators are about a maximum energy requirement for a dwelling, a maximum primary fossil energy use and a minimal share of the use of renewable energy. In addition, the government has expressed the ambition in the new coalition agreement that all the dwellings in the Netherlands have to be removed from the gas grid in 2050. In order to achieve these objectives, more and more articles are emerging during the writing of this thesis, in which the government is increasingly coming up with solutions to meet these objectives. These developments and measures for new dwellings are likely to lead to an increase in construction costs, but also to a possible change in the value of the dwellings. In addition, these extra costs and the changing of the value of dwellings also cause a change in the land values. This only applies when the land value is calculated with residual method of valuation for land, the most important parameters for the land value are therefore the market value of the dwelling and the construction costs of a dwelling. When these two parameters are subtracted from each other, the residue that remains is the value of the land. Several studies have already been carried out into the effect of sustainability on the value of real estate. Contradictory answers have emerged in these different studies. In addition, these studies focused on the energy label while this study also focuses on future sustainability measures. In order to answer the above problems, the following main question has been formulated:

***"What is the effect of sustainability on the value of new dwellings and land?"***

The aim of this research is to gain insight into the new legislation and regulations relating to sustainability and dwellings. Followed by investigating the consequences for the values and costs of new dwellings through these laws and regulations. And as a result of this investigation, Gloudemans wants advice on how the economic effects on dwellings can influence the value of land.

The literature shows that the BENG entails considerable costs. These costs can even amount to € 30.000,- extra construction costs compared with EPC 0.4 dwelling (LenteAkkoord, 2017). The extra costs for a home without gas connection can be around € 15.000,- by the installations that have to be purchased to replace the gas connection (Cobouw, 2017). Yet the question is whether these costs will really be so high. The construction cost index provides insights into the developments of the construction costs of recent years. Looking back on these developments in the EPC values of the past years, a special line can be seen. With every introduction a new EPC weighting, an increase in building costs can be seen. But

after a certain period, these costs decrease again, or the increase in costs stops (Vonk, de Wilde, & de Groot, 2017). In addition to a cost increase due to sustainable construction, a possible increase in value may also arise. Brounen, et al 2011 already shows that in 2011 an increase can be seen in the value of a dwelling with a more sustainable energy label. Nevertheless, studies by Calcasa, 2016 and the Rekenkamer (Audit Office), 2016 shows that these positive effects are not only due to sustainability, but that many more factors play a role in the value of the dwellings. Consider, for example, that dwellings with an A label almost are new dwellings, and these new dwellings are almost always larger than dwellings with a less sustainable energy label.

To provide more clarity in these contradictions, mixed methods are used in this study. Because the future is not predictable, first, the current effect of sustainability on the transaction price of dwellings is investigated through hedonic price analysis. By means of in-depth interviews, it is investigated how the results of the current effects can be translated into the future effects on the value of housing.

The results from the hedonic price analysis show after an analysis an average transaction price decrease of 9% when a label A dwelling is compared with a label B dwelling. And even a transaction price decrease of 13% occurs when comparing a energy label B dwelling with an energy label C dwelling. It is striking when comparing a label C dwelling with an energy label D (or lower) dwelling, a price increase occur of 1,4%. These value effects are also comparable with the literature. The hedonic price analysis shows also that factors such as the size of a dwellings and location having a larger effect on the value of dwellings. These results are also confirmed from the interviews. However, the interviewees indicate that in the case of massive construction of sustainable dwellings and good marketing, positive effects can ultimately be seen on the value of these dwellings. An attempt was also made with these in-depth interviews to give an impression of the effects of BENG and gasless building on the value of new dwellings. The interviewees mainly indicated that they expect that the value of "non-sustainable" dwellings will decline in the future. In addition, they have the opinion that the outlined additional construction costs for BENG and gasless in the literature are correct. However, interviewees indicate that these additional costs may change after a certain period due to mass production and innovation. In the area of land value, it is expected that a decrease may occur if the construction costs of dwellings rise but the value does not increase in the same line. However, the interviewees indicate that the land value can be dealt with in a different way.

At present, there is a positive effect of sustainable measures on the value of real estate. The future expectation is that non-sustainable housing will become less valuable. And because of the massive construction of BENG dwellings, the costs in the long term will not be as high as is now outlined. All in all, this means that in the short term negative effects on the land value will arise, but that after a longer period, the effects on the land values will not that high.

## **Samenvatting**

Duurzaamheid is een steeds meer voorkomend en belangrijker begrip aan het worden, ook in de vastgoedwereld. Vanwege de grote hoeveelheid uitstoot CO<sub>2</sub>, waarvan 40% door de bebouwde wereld wordt veroorzaakt, worden er maatregelen genomen door overheden en doelstellingen gesteld. Een maatregel die wettelijk is vastgesteld is BENG (Bijna Energie Neutrale Gebouwen). BENG vervangt de huidige EPC normen en bestaat uit 3 indicatoren. Deze indicatoren gaan over een maximale energie behoefte van een woning, een maximaal primair fossiel energiegebruik en een minimaal aandeel van het gebruik van hernieuwbare energie. Daarnaast is er vanuit de overheid in het nieuwe regeerakkoord de ambitie uitgesproken om in 2050 alle woningen in Nederland van het gas af te halen. Om deze doelstellingen te halen komen tijdens het schrijven van deze thesis ook in het nieuws steeds meer berichten naar voren waarin de overheid steeds meer oplossingen aandraagt om deze doelstellingen te halen. Deze ontwikkelingen en maatregelen voor nieuwe woningen zullen vermoedelijk zorgen voor een stijging in de constructiekosten, maar ook voor een mogelijke verandering in de waarde van deze nieuwe woningen. Daarnaast zorgen deze extra kosten en het veranderen van de waarde van woningen ook voor een verandering in de grondwaarden. Dit geldt alleen als de grondwaarde residueel wordt berekend, de belangrijkste parameters voor de grondprijs zijn dan ook de marktwaarde van de woning en de constructiekosten van een woning. Als deze twee parameters van elkaar worden afgetrokken, is het residu dat overblijft de grondwaarde. Er zijn al meerder studies uitgevoerd naar waardeverandering door verduurzaming. Hier zijn tegenstrijdige antwoorden naar voren gekomen. Daarnaast waren deze studies gericht op het energielabel en richt dit onderzoek zich ook op de toekomstige duurzaamheidmaatregelen. Om een antwoord te kunnen geven op de bovenstaande problematiek is de volgende hoofdvraag opgesteld:

**"Wat is de relatie tussen duurzaamheid en de economische waarde van nieuwe woningen en grondwaarden?"**

Het doel van dit onderzoek is omzicht te verkrijgen in de nieuwe wet en regelgeving met betrekking tot duurzaamheid. En het onderzoeken van de gevolgen voor de waarden en kosten van nieuwe woningen door deze wet en regelgeving. Gloudemans wil advies over hoe de economische effecten op de woningen van invloed kunnen zijn op de waarde van gronden.

Uit de literatuur komt naar voren dat de BENG aanzienlijke kosten met zich mee brengt. Deze kosten kunnen zelfs oplopen tot €30.000,- extra kosten t.a.v. EPC 0,4 woningen (LenteAkkoord, 2017). De extra kosten voor een woning zonder gasaansluiting kunnen rond de €15.000,- zijn door de installaties die moeten worden aangeschaft om de gasaansluiting te vervangen (Cobouw, 2017). Toch is de vraag of deze kosten echt zo hoog zullen zijn. De bouwkostenindex geeft inzichten in de ontwikkelingen van de bouwkosten van de afgelopen

jaren. Terugkijkend op deze ontwikkelingen in de EPC waarden van de afgelopen jaren is een bijzondere lijn te zien. Bij elke invoering een nieuwe EPC verzwaring is een stijging in de bouwkosten te zien. Maar na een bepaalde periode dalen deze kosten weer, of neemt de stijging in de kosten af (Vonk, de Wilde, & de Groot, 2017). Naast een kostenstijging door het duurzaam bouwen, kan er ook een mogelijke waardestijging ontstaan. Brounen, et al 2011 laat al zien dat er in 2011 een stijging is te zien in de waarde van woningen met een duurzamer energielabel. Toch laten onderzoeken van Calcasa, 2016 en de rekenkamer, 2016 zien dat deze positieve effecten niet alleen komen door de duurzaamheid, maar dat hier veel meer factoren een rol spelen op de waarde van de woningen. Denk hierbij aan dat woningen met een A label bijna altijd nieuwe woningen zijn, maar ook dat deze nieuwe woningen bijna altijd groter zijn dan woningen met een minder duurzaam energielabel.

Om meer duidelijkheid te verschaffen in deze tegenstrijdigheden is er gekozen voor een mixed methoden onderzoek. Omdat de toekomst niet voorspelbaar is wordt het huidige effect van duurzaamheid op de transactieprijs van woningen onderzocht door middel van hedonische prijs analyse. Aan de hand van diepte-interviews wordt onderzocht hoe de resultaten van het huidige effect kunnen worden vertaald naar de toekomstige effecten op de waarde van woningen. De resultaten uit de hedonische prijs analyse laten na een diepe analyse zien dat er positief effect op de waarde ontstaat door duurzaamheid. Een label stap van B naar A zorgt voor een waardestijging van 9% en C naar B zelfs 13%. Dit komt overeen met de resultaten vanuit de literatuur. Uit de hedonische prijs analyse blijkt dat factoren zoals de grootte van een woning en locatie een grotere rol hebben in de waardebepaling van woningen. Geïnterviewden geven ook aan dat bij massale bouw van duurzame woningen en een goede marketing, uiteindelijk wel positieve effecten te zien op de waarde van deze woningen. Ook is getracht om met deze diepte interviews een beeld te schetsen over de effecten van BENG en gasloos bouwen op de waarde van nieuwe woningen. De geïnterviewden geven vooral aan dat zij verwachten dat de waarde van "niet duurzame" woningen zal gaan dalen. Daarnaast zijn zij van mening dat de extra constructiekosten voor BENG en gasloos die in de literatuur worden geschat kloppen. Wel geven geïnterviewden aan dat deze extra kosten na een bepaalde periode kunnen veranderen door massaproductie en innovatie. Op het gebied van grondwaarde is de verwachting dat een daling kan ontstaan als de constructiekosten van woningen stijgen maar de waarde van de woningen niet in dezelfde lijn meestijgt. Wel geven de geïnterviewden aan dat er op een andere manier met deze grondprijzen kan worden omgegaan.

Op dit moment is er een positief effect te zien van duurzame maatregelen op de waarde van vastgoed, maar er kan geen exacte waardestijging worden gegeven omdat meerdere factoren een rol spelen. De toekomstverwachting is dat "niet" duurzame woningen minder waard zullen worden. En door de massale bouw van BENG woningen zullen de kosten op lange termijn lang niet zo hoog zijn als nu wordt geschat. Al met al zal dit betekenen dat op korte termijn negatieve effecten op de grondprijzen zullen ontstaan, maar dat na een langere periode, deze effecten erg zullen meevalen.

## **Abstract**

The built environment is responsible for 40% of the CO<sub>2</sub> emissions in the Netherlands. The government responds by taking measures to make the built environment more sustainable. These measures also affect the construction of new dwellings. These measures are expected to increase the construction costs of dwellings. It is not clear how much these additional costs will be and whether these measures will lead to an increase in value. And because both, the construction costs and the market value of dwellings are the parameters in calculating the land value with the residual method of valuation for land, the following main question has been conducted; *What is the effect of sustainability on the economic value of new dwellings and land values?* The aim of this research is to obtain insights into the new law and regulations concerning sustainable construction and the consequences for the values and costs of new dwellings. In addition, Gloudemans want to know how these effects on the dwellings may affect the land value. To investigate this, a theoretical framework has been established. After this, a hedonic price analysis is conducted to research the current effect of sustainable measures on dwellings. Hereafter, dept interviews are used to clarify the literature and quantitative analysis, but also to make a vision about the future effects of the new measures. At present, there is a positive effect of sustainable measures on the value of real estate. The future expectation is that non-sustainable dwellings will become less valuable. And due to the massive construction of dwelling which comply with BENG, the costs in the long term will not be as high as currently outlined, namely around €30.000,- additional costs. This means that in the short term, negative effects on the land value will arise when calculating residual, because the construction costs will be higher, while the market value will not be much higher. But after a longer period, the effects will not be that high on land values.

## Glossary

- **Contractor:** A contractor can be defined as a company that takes responsibility for realizing and coordinating construction activities.
- **Dwelling:** A dwelling is a built-up property object including property that can be used for permanent residence without being dependent on essential facilities outside the dwelling (De Kousemaeker & Agt, 2006). In this research, apartments are not included.
- **Market value:** The estimated amount for which the property should exchange on the date of valuation between a willing buyer and a willing seller in an arm's length transaction after proper marketing wherein the parties had each acted knowledgeably, prudently and without being under compulsion (Berkhout & Roggeveen, 2017, p. 21).
- **Real Estate Agent:** A Broker is an intermediary who mediates in establishing agreements between client and one or more third parties (De Kousemaeker & Agt, 2006).
- **Residual Method of Valuation for Land:** For determining the value of land, all the starting points of an ground exploitation are entered except the value of land. The most important parameters for the value of land are in this research, the market value of dwellings and the construction costs of the dwellings (Gloudemans, 2018). When subtracting the total construction costs of the market value of a dwelling, the residue that remain is the land value.
- **Sustainability in the future:** In this research, sustainability in the future is operationalized as the future measurements regarding to sustainability.
- **Sustainability now:** In this research, the current sustainability is the best measurable as the energy label. Sustainability now is operationalized as energy label.
- **Transaction price:** The transaction price is the actual amount ultimately paid for the property.
- **Valuation report:** The valuer makes a full valuation, based on a calculation that is further explained in a valuation report (De Kousemaeker & Agt, 2006).
- **Valuer:** An valuer is an independent and certified person who writes a valuation report (RICS, 2016).

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# 1 Introduction

## 1.1 Problem definition

Sustainability is a broad concept that is used for socially responsible living, the environment, ecology and future-oriented thinking (Platformduurzaamheid, 2018). The concept of sustainability has also become an important theme in the real estate world. This is partly due to the increase in CO<sub>2</sub> emissions and the role of real estate. Buildings and the construction sector are together responsible for about 36% global energy use and even for 39% responsible for energy related carbon dioxide emissions (UN Environment, 2017). These figures can also be seen in the Netherlands, the built environment is held responsible for 40% of CO<sub>2</sub> emissions in the Netherlands (Bouwtotaal, 2017) (Cobouw, 2017). It can therefore be concluded that the real estate world has a huge role in causing CO<sub>2</sub> emissions. This also means that making the real estate world more sustainable, can have an enormous impact on our environment. It is therefore more than logical that the real estate plays a major role in global, European and national sustainability agreements. Within these agreements, a number of strategies and goals have been drawn up, which ultimately results in laws and obligations.

### 1.1.1 Agreements

One of the most important agreements is the Paris Agreement 2015. From this Paris Agreement, legally binding agreements are concluded for the climate for all countries in the world. These rules will apply from 2020. Overall goal in this agreement is holding the increase in the global average temperature below 2 degrees and limit the temperature increase to 1,5 decree (United Nations, 2015). From Europe, 20, 20, 20 goals were already set in 2010. This states that there should be 20% less CO<sub>2</sub> emissions compared to 1990. But also 20% less energy consumption and 20% of the energy must be from renewable energy. These goals were set for 2020 and have been already achieved.

But in order to achieve goals of the Paris Agreement, new goals have emerged from the EU. An overarching European green house gas reduction target of 40% compared to 1990 in 2030. A European target of 30% renewable energy by 2030. And an indicative European saving target of 27% by 2030. In addition, the EU has set a climate target to 2050. This goals is a greenhouse gas reduction of 80% to 95% compared to 1990 (Europadecentraal, 2017). The Netherland has also agreed with the Paris Agreement. And therefore also agreed with the goals set by Europe (Tweede Kamer de Staten- Generaal, 2017). BENG is one of the most important measures to reach these goals.

### 1.1.2 BENG

The Netherlands has the ambition first of all to have a fully energy-neutral built environment by 2050. In order to achieve this goals, it is necessary to build (almost) energy-neutral from 2020. This must be achieved by the BENG regulations (Almost Energy Neutral Buildings) that all building application must meet from 1 January 2020 (Nieman, DGMR Bouw B.V., 2017).

BENG consists of three requirements, BENG 1; The maximum energy requirement, 25 kWh per m<sup>2</sup> of user surface per year. BENG 2 is the maximum primary fossil energy, 25 kWh per m<sup>2</sup> of use per year. And BENG 3; the minimum share of 50% renewable energy.

These BENG rules are the results of both, the European EPBD and the Dutch Energy Agreement. The EPBD are the European Performance Building Directive. From this EPBD, rather demands arise like the EPC. These are the requirements for the energy efficiency of new dwellings and utility buildings. Requirements described in these EPC standards are thermal insulation of buildings, ventilation and air permeability of buildings and the energy performance standard for valuing energy saving measures at area level. Together, these requirements lead to one EPC standard. BENG replaces the EPC requirements (RVO, 2017). The BENG requirements are much stricter, because there cannot be compensated, and three requirements have to be met.

### **1.1.3 Energy label**

From this EPBD also the energy label obligations emerged, who are still valid at this moment. These energy labels became mandatory from 2008 and were maintained from 2015. From the EU it was made mandatory that every dwelling received an energy certification. Energy labels can be used to see how energy-efficient a dwelling is, compared to other dwellings. These energy labels are therefore also currently the best measurable way of comparing dwelling with each other. This is also the reason why different studies used energy labels for searching the effect of sustainability on the value of dwellings. The most known study is from Dirk Brounen, he investigates dwellings with an energy label and compared the labels to each other. He concluded that an energy label was visible and buyers pay an average of 3 percent more for a sustainable dwelling (label A, B) (Brounen & Kok, 2011). Nevertheless, there are other studies that question those value increases in sustainability like a recent conducted study in Norway to energy certificates. A positive effect for sustainable labels was visible, but disappeared when the results were better examined (Olaussen, 2017).

### **1.1.4 Gas connection**

In addition to BENG and the uncertainties about the added value of sustainability, dwellings without a gas connection are also an item that should be included in this study. In the coalition agreement of 2017, the ambition was expressed to remove phased dwellings from the gas connection, achieved by 2050. (Rijksoverheid, 2018). These ambition has also to do with the situation in Groningen, the earthquakes caused by drilling for gas. There are also contradictions when it comes to both, the costs and the values of new dwellings without a gas connection. Stedin has researched the costs of new dwellings without a gas connection. Stedin conclude that that dwellings without a gas connection are cheaper. The investment is higher, but the energy costs are lower for the residents (DWA / PAS bv, 2017).

### **1.1.5 Land value**

There is still a lot unclear about the added value and costs of sustainability (BENG and dwelling without gas). Nevertheless, it is important to map this out, because extra

construction costs are also attached to these sustainable investments. The additional costs to comply new dwellings to BENG vary considerably, but are certainly present. For the market, it is important to know how much a property will become worth more when it is sustainable. But also for planning economics and municipalities, it is important to know what sustainability does with both, the value and the costs of a dwelling. This has also to do with the land value. Both, foundation costs and the market value of dwellings are of great importance when calculating the land value with the residual land value valuation. These are even the parameters that determine the value of the land. This already shows the connection between sustainability and land. The residual methods forms the theoretically optimal calculation for a transparent and market-based land value (Ten Have, 2002). The residual method is the method that public and private parties use most often when valuing the land of their development portfolio. Also municipalities are the largest parties on the land market.

At this moment, municipalities opt for stimulations on the land market to build sustainable. For a sustainable dwelling, it can actually be seen that by offering a discount on the land value, a price subsidy is given to developers who build sustainable. At this moment, there are less obligation to sustainability but it in the future, it is mandatory build sustainably with more strict rules. About the costs of these strict rules is a lot of uncertainty. And in order to be able to make higher investments when necessary, a higher yield have to be realized for achieving the same land value as for non sustainable real estate. However, the value of real estate is determined by the market of supply and demand and not by the degree of investment for the production of sustainable real estate. It is certain that these effects are dynamic. There are also other positive effects of sustainable dwellings that cannot be seen in the residual calculation. For example, sustainable dwellings provides lower energy costs, but this is not visible in the land value.

This study focuses on the issue of the added value of sustainability. In this research, the focus starts with dwellings and is extended to what sustainability does with the value of land. Because the residual land value valuation is maintained in this research, it is important to first focus on the effects on dwellings. Next, it is possible to examine what the results for real estate mean for the value of land.

## **1.2 Objectives**

The aim of this research is to obtain insights into the new legislation and regulations relating to sustainability and investigates the consequences for the value and costs of new dwellings. These consequences can also have an effect on the value of land, therefore the second goal in this research is investigating the effects on the land value.

- 1 The first objective aims to gain insights in the relationship between sustainability and the value of new dwellings and translate laws and regulations in the field of sustainability to concrete economical consequences.
- 2 As a logical consequence of the first goal, Gloudemans wants an advice on how the possible value change of new dwellings may influence the land value. This will be done with the residual method of valuation for land. With this method, the effect of the value of real estate on the land value can be measured.

## **1.3 Research question**

The following research question is conducted to answer the research problem;

***“What is the effect of sustainability on the value of new dwellings and land?”***

In order to answer this question, a number of sub questions must be answered before the objectives can be outlined. The following sub-questions are per objective described;

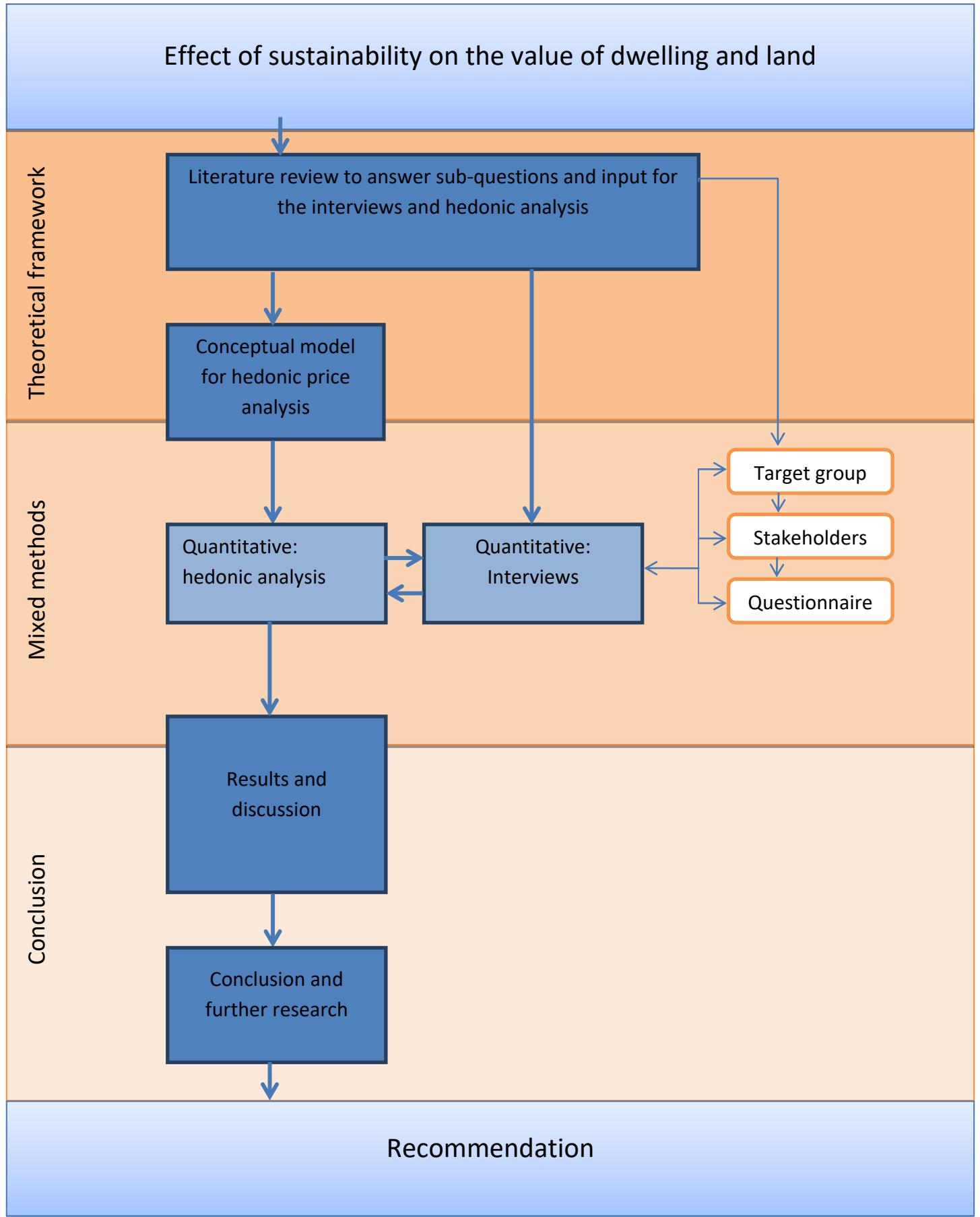
### **Sub-questions for Objective 1:**

1. How is sustainability determined and operationalized?
2. What are the future laws and regulation for dwellings regarding to sustainability?
3. How is the value of dwellings determined and what are the influencing parameters?
4. What are the current effects of sustainability on dwellings?
5. What are the future effects of sustainability on the value of dwellings?

### **Sub-question for Objective 2:**

6. How is the value of the land currently determined and what are the parameters?
7. What is the effect of these parameters on the value of land in the future?
8. What do the outcomes mean for Gloudemans? (advice)

## 1.4 Research design



## **1.5 Relevance**

This section shows to what extent this study is relevant on social en scientific level.

### *Scientific relevance*

There are different academic articles about the effects of sustainability on the value of new dwellings. Yet these articles are not aimed on the new laws and regulations that will start in 2020. Articles also contradict each other, or question each other's results. There are also articles that are out of date while the market has changed considerably. This study does research on what sustainability does with the value of new dwellings, and make its own judgment with its own results. In addition, it is unclear how the land value responds to the new legislation and regulations. Land value for new dwellings is generally calculated with the residual land valuation method. As a result, the economical effect of the new laws and regulations on dwellings play a major role. There are not many scientific articles that have researched the effects of sustainability on land value. One of the studies that currently addresses the effect of sustainability on the land value is from Liem, 2016. However, this study is aimed at a different market segment than new dwellings. Nor does it deal with the new laws and regulations regarding to sustainability.

### *Social relevance*

By providing insights into the upcoming regulations with regard to sustainability and new dwellings, a translation has been made into the effect on the value. The clarification of this value can help the construction industry in understanding the effects of making the built environment more sustainable. In addition, the insights into the effects on the value of land also provide new insights for both municipalities and planning economists. Thanks to these insights, the consequences of sustainability on the land value can be viewed in a different way.

## **1.6 Reading guide**

The structure of this report is described in this section. After the introduction, the literature review can be found in chapter 2. This review starts with explaining the concept sustainability. After this, the laws and regulation regarding to sustainability and new dwellings are described. Hereafter, the value and costs of sustainable dwellings is described, followed by the market and effects on the land value. The literature review is concluded with a first analysis of the results and a conceptual model. The third chapter is de methodological approach. Hereafter, in the fourth chapter, the hedonic price analysis is explained, variables are also operationalized and the results described. In chapter 5, the qualitative part of this research is explained and contains the results of the quantitative analysis and the in-depth interviews. These chapters are followed up by the discussion chapter. The results are compared with the literature and discussed. In the last and seventh chapter the main question is answered and the discussion, recommendations and suggestions for follow-up research are discussed.

## 2 Theoretical framework

In this theoretical part of the research, the most important theories and literature are described regarding to sustainability and the effects on the value of real estate and land values. Knowledge, theories and models will further shape the research and form the basis for the methodologies that are used in this research. This review end with an analysis of the theory that has been found.

### 2.1 Definitions Sustainability

This research investigates the effects of sustainability on the value of new dwellings. In order to investigate this, first of all the definition of sustainability must be considered. In this first chapter of theoretical background we will discuss sustainability in general and the integration of sustainability by the government. There are so many terms known that a choice must be made which definitions are used in this research. First, definitions from the literature will be described. And to make this research the most concrete, it will be based on measures imposed by the government and so the definitions from the Dutch government and the European Commission are described. Defining sustainability can be in different aspects, sustainable real estate, sustainable development. And within these aspects, there are different definitions.

#### 2.1.1 Definitions from the theory

##### 2.1.1.1 Sustainability

As already mentioned. sustainability is a worldwide analyzed term, according to the literature, J.W. Hansen et al 1995 defined sustainability as; the ability of dynamic, stochastic, purposeful system, its components, boundaries and hierarchical context to continue to the future (Hansen & Jones, 1996). In this definition, an important element is the reference to the future. The connection with the future is a recurring element in the following described definitions. This can also be found in the goals of the Paris agreement 2015; "*the Netherlands must enter a transition path in which all energy and industry-related CO<sub>2</sub> emissions between 2025 and 2035 needs to reach a level of zero* (Sterl, Hohne, & Kuramochi, 2016)". Another, also referring reference to the future is from Hodge 1997; Sustainability is defined as the persistence over an apparently indefinite future of certain necessary and desired characteristics of both the ecosystem and the human subsystem within (Hodge, 1997). A more global vision of sustainability is the striking balance between 'environment', 'economy' and 'equity'. The dimension environment is about conserving the natural resources so they can be enjoyed by the future generation. Economy is defined as the growth of the economy and its negative impacts on the natural environment. Equity is defined as social dimension in a way of a fair share of benefits to every individual (Berke, 2002) (Godschalk, 2004).

#### *2.1.1.2 Sustainable development*

The terms sustainability and sustainable development are two terms that are quite similar in description. But since this research focuses on the development of new dwellings, it is chosen to include these definitions. To achieve sustainability in development, it requires a complete view and covering not only the product and the process involved in its production, but also the entire supply chain and the manufacturing system (Faulkner & Badurdeen, 2014). In order to achieve sustainable development, a worldwide definition was already issued in 1987, in the Brundtland report:

*"Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs (World Commission on Environment and Develop Our Common Future, 1987)"*

This definition from the Brundtland report is similar to the definitions already described in the previous paragraph. Taking the future into account is also in this definition an important part.

#### *2.1.1.3 Sustainable real estate*

The main focus in this research is sustainable real estate. An unambiguous definition for sustainable real estate is not available in the literature. Both, in Dutch and foreign literature are different names and definitions. A first definition can be found in the IVBN. Sustainable real estate is built or modified to make a minimal seizure of scarce resources, materials, energy, water and locations while optimally functioning, care for tenant satisfaction and indoor environment and health (IVBN, 2009). Another word for sustainable building is green building. Within these green buildings are four pillars, namely the minimizing of environmental impact, the enhancement of health conditions of building users, the economical returns to investors and local community, the life cycle impact on the planning and development and operational phases (Robichaud & Anantatmula, 2011). Another definition of green buildings is from J. Yudelson 2007; A green buildings is a high-performance property that reduces his impact on the environment and human health. This green building is designed to use less water and energy as well as to reduce the life cycle environmental impact of the used material (Yudelson & Fedrizzi, 2007).

#### *2.1.1.4 Energy neutral*

When looking more specifically at sustainability and dwellings, quickly the topic of energy neutral will be found. Both, the European Commission and other literature such as Shanti Pless et al. (2010) , Marszal et al. (2009) and Greco (2017) are referring to the definition of energy neutral by Torcellini et al. (2006). In the literature, they also call energy neutral buildings; Net-Zero Energy Buildings. The main definition from Torcelinni et al. (2006) is; "A net zero-energy (NZEB) building is a dwelling or commercial building with greatly reduced energy needs through efficiency gains such that the balance of energy needs can be supplied with renewable technologies". Furthermore, Torcellini et al. (2006) uses four commonly

used accounting methods. Each definition uses the grid for net use. (Torcellini , Pless, Deru, & Crawley, 2006):

### **2.1.2 Definitions from governments: EU**

The definitions from the literature are an important part of this research, more important is how the governments define sustainability. This is the basic of how the policies about sustainability are written, and these policies will be used in this research. First the definitions from the European Commission are clarified because these are the basis for the Dutch government, hereafter, the scope is on the Dutch government.

#### *2.1.2.1 Sustainability according to the European commission*

Sustainability is defined by the European Commission as sustainable development, this stands for meeting the needs of present generations without endanger the ability of future generations to meet their own needs , in other words, a better quality of life for everyone, now and for generations to come. This definition offers a vision of progress that integrates immediate and longer-term objectives, local and global action, and regards social, economic and environmental issues as inseparable and interdependent components of human progress (European Commission, 2015).

#### *2.1.2.2 Energy neutral according to the European commission*

As already indicated, there is no clear definition for sustainable dwellings, this is often found in the literature as energy neutral dwellings. The term energy neutral is also used by the European Commission. Energy neutral dwellings are described by the European Commission as dwellings or buildings with a very high energy performance. The low amount of energy that these buildings require comes mostly from renewable sources. In the Energy Performance of Buildings Directive is described that all new buildings need to be nearly zero-energy by the end of 2020. According to the European Commission, all EU countries have to draw up national plans to increase the number of nearly zero-energy buildings (European Commission, 2015).

### **2.1.3 Definitions from governments: Netherlands**

The definitions from the European Commission are described in the previous paragraph, they are the basis for the Dutch definitions. The similarity with the European definitions is also clearly visible.

#### *2.1.3.1 Sustainability according to the Dutch Government*

The Dutch government defines sustainable real estate to avoid confusion around the different energy ambitions. They indicate that the use of the building is about the CO<sup>2</sup> emission due to energy consumption, this is comparable with an energy neutral dwelling described by the European Commission (Rijksoverheid, 2017). There is no real definition from the Dutch Government, but the Dutch Government however does have in its coalition agreement some articles how to deal with sustainability. In the Dutch Government 2013 states the policy article 21, Sustainability. The overall objective of this article is to counteract

the devolution of the effects of Dutch production and consumption in other living areas and future generations. This purpose or definition closely matches the definitions of literature and the EU. The goal of the Netherlands is now changed to the policy article 21, 2018. The objective is now promoting the circular economy with aim of preserving natural resources, viewing the economic chain and resource of emissions and the strengthening of the Dutch economy (Rijksoverheid, 2018). It is clear that this last definition is more specific and less in line with the European Commission.

#### *2.1.3.2 Energy neutral buildings according to the Dutch government*

Energy neutral is a widely used term in the Netherlands. According to Ministry of Housing, Spatial Planning and the Environment, the most comprehensive study of the definition of energy neutral buildings is from the "platform Energy Transition Built Environment (PeGO) (Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer, 2010). The definition of energy neutral can be seen as a project or building that does not require net imports of fossil or nuclear fuel from outside the system to set-up, use and degrade the building. This simply means that the energy use within the project boundary is equal to the amount of renewable energy generated within the project boundary or attributable to external projects on the basis of external measures. The energy consumption that occurs from the construction and demolition of the building is calculated according to the annual contribution based on the expected life of the building (Alsema, 2009). A building is energy neutral when a home or building has an EPC of exactly zero. New buildings from 31 December 2020 have the requirement to be "almost-energy neutral". The EPC value of these buildings needs to be closely to zero. Energy neutral is also considered as the annual total of building-based and user-driven energy consumption minus the revenue from local sources. When a building is entirely self-sufficient and not connected to the gas grid nor the energy grid, then the building is autarkic. (Rijksdienst voor Ondernemend Nederland, 2017). There are more requirements regarding to sustainability. These requirements are described in the following paragraph per level of government.

#### **2.1.4 Conclusion**

The measures that are taken with regard to sustainability and real estate all have to do with energy saving and the reduction of CO<sub>2</sub> emissions. That is why it is important to include both the concept of sustainability and energy neutral. The notion of energy neutral is roughly the same from the literature as the EU and the Dutch government. The choice is made to use both definitions from the European Commission:

**Energy neutral:** *dwellings with a very high energy performance and the low amount of energy that these buildings require comes mostly from renewable sources.*

**Sustainability:** *Meeting the needs of present generations without jeopardizing the ability of future generations to meet their own needs.*

## **2.2 Implementation sustainability in law and policy**

The previous sections have described the terms sustainability and energy neutral in both, literature and definitions from governments. This chapter focuses on how sustainability is implemented by the government in the real estate market. The implementation by governments is an important part of this research and makes this definition more concrete. The implementations are obligatory towards the construction world, and will therefore play an important role. It starts with the world wide Paris Agreement, then more specific the rules from the EU, and will furthermore focus on the Dutch law and regulations regarding to sustainability now and in the future.

### **2.2.1 Paris Agreement**

At the climate top in December 2015, 174 countries signed an international climate agreement. This agreement is signed to deal with greenhouse gas emissions and improve the global climate (United Nations, 2016). As a result of this agreement, the EU and the Netherlands designed laws and rules to comply with this agreement. The following paragraphs will therefore elaborate on rules from the EU and the Netherlands.

### **2.2.2 EU: implementation of sustainability by law**

Within the European Commission, clear goals have been set for energy and buildings because 40% of the total energy consumption of the EU comes from buildings. The key Laws are the 2010 Energy Performance of Buildings Directive (EPBD) and the 2012 Energy Efficiency Directive (EED). These key laws are the EU's main legislation covering the reduction of the energy consumption of buildings.

#### *2.2.2.1 EU: Energy Performance of Buildings Directive (EPBD)*

On January 4, 2003, the European Energy Performance Buildings Directive was published and entered into force and 2010 adapted to the current guidelines. This directive targets to stimulate the improvement of the energy performance of buildings in the EU. These so called 20% targets are a set of binding legislation to ensure the EU meets its climate and energy targets for the year 2020. The 2020 package sets three key targets, 20% cut in greenhouse gas, 20% of energy from renewables and 20% improvement in energy efficiency (European Commission, 2017). The directive includes climatic and local conditions outside the building and the requirements for indoor climate and cost-effectiveness. Under this law, a number of important measures have been taken which governs the Netherlands by its laws, some important measures are (European Commission, 2017):

- Energy performance certificates (energy labels) are to be included in all advertisements for the sale or rental of building's;
- All new buildings must be nearly zero energy buildings by 31 December 2020 (public buildings by 31 December 2018);

- EU countries must set minimum energy performance requirements for new buildings, for the major renovation of buildings, and for the replacement or retrofit of building elements (heating and cooling systems, roofs, walls and so on);
- EU countries have to draw up lists of national financial measures to improve the energy efficiency of buildings.

#### *2.2.2.2 EU: Energy Efficiency Directive (EED)*

The second law of importance regarding to sustainability and real estate is the Energy Efficiency Directive (EED). The 2012 Energy Efficiency Directive establishes a set of binding measures for both, Member States like the Netherlands and Companies to help the EU reach its 20% targets by 2020 (European Commission, 2017). Under the EED law are a number of requirements who are leading for European countries. Important requirements regarding to buildings and sustainability are (It is important that these rules are really aimed at the member states and companies. And so they will indirectly influence the construction sector):

- EU countries make energy efficient renovations to at least 3% of buildings owned and occupied by central governments;
- EU governments should only purchase buildings which are highly energy efficient;
- EU countries have to draw up lists of national financial measures to improve the energy efficiency of buildings;
- 30% energy efficiency target for 2030.

#### **2.2.3 Dutch: Implementation of sustainability by law at this moment**

The measures from the European Commission are the basis for the Dutch rule regulation. This paragraph focus on the Dutch rules at this moment. These Dutch regulations will directly influence the construction sector, and so also on this research. There are a number of agreements, decisions and laws in the Netherlands that are focused on the preservation of buildings. This research will only focus on the rules that apply to new dwellings. The current regulations for energy performance of buildings derive from the European Directive, the EPBD. This is the current energy label (rvo, 2017). The Law and rules for new buildings are at this moment stated and written in the EPC norms and Building Decree. The most important measures at this moment for integrating sustainability are the energy label and rules stated in the Building Decree (EPC norms).

##### *2.2.3.1 Energy label*

The energy label is one of the most frequent used certificates to measure the sustainability of dwellings. Various studies have already tried to measure the value of sustainability through the energy label in the past years. In the Netherlands, the energy label was already mandatory in 2008 from the European EPBD. But it was only maintained from January 1, 2015. The energy label for dwellings is an instrument that contributes to the achievement of the objective that is laid down in the Energy Agreement. The energy performance is the calculated or measured amount of energy that is required to meet the demand for energy, associated with a normal use of a building, including energy used for heating, cooling,

ventilation, heating and lighting. The energy label is the written declaration related to the buildings energy performance. The energy label must state the following information (wetten.overheid, 2016):

- The results of the calculation of the energy performance;
- A list with reference values that can compared with the energy performance;
- Includes recommendations for a cost-effective improvement in energy performance.

In the Regulation Energy Performance Buildings (REG), the performance of giving an energy label is described (wetten.overheid, 2017).

#### *2.2.3.2 Building decree 2012 (Bouwbesluit)*

All buildings in the Netherlands must comply with the 2012 Building decree, so also new buildings. A building may not pose a danger to residents, users and the environment. That is why the government has laid down regulation for safety, health, usability, energy efficiency and the environment in the Building Decree. Within this building decree are 2 departments that deals with energy efficiency and the environment. Here, by means of the NEN 7120, a certain height is given to the value of the energy performance coefficient (EPC), at this moment, it is 0,4, but in 2020, it will be almost zero. The EPC rules will be replaced by BENG, this is discussed in the next paragraph (rvo, 2017).

### **2.2.4 Dutch: Implementation of sustainability by law in the future**

The previous paragraph described the current regulation regarding to sustainability. But because this research focus on new dwellings, it is important to describe the future rules and regulations. BENG will be the most important measure for the coming years and will replace the current EPC norms.

#### *2.2.4.1 BENG*

BENG stands for Almost Energy Neutral Buildings and results from the EnergieAkkoord and from the European directives (EPBD) (RVO, 2017). The BENG requirements will replace the current EPC norms and Minister Ollongren had decided that all permit applications for new dwellings should apply to BENG from 1 January 2020 (LenteAkkoord, 2017). The definition of BENG is in Europe globally established in the EPBD. The government has developed the indicators within the European framework. The most important difference between BENG and EPC is, the EPC norm gives only one value to the energy performance of a building, this makes it possible to compensate a moderate score with a higher other score within the EPC. With BENG, you must meet with three different scores, it is in this case not possible to compensate.

It is important to take into account that BENG has been largely established, but is still under development. For example, the requirements package must still be established. The final requirements may therefore differ in the future (LenteAkkoord, 2017). The indicators and requirements of BENG are based on an analysis of energy flows of highly energy efficient buildings. These requirements are contained in a letter of 2 July 2015 from the minister for

housing and public service to the second chamber. This letter states that by 2020 all new dwelling permits must be energy neutral. For government buildings this is already from January 1, 2019 (RVO, 2017). The three requirements from BENG are:

- BENG 1: The maximum energy requirement in kWh per m<sup>2</sup> of surface area per year (intended requirement is a maximum of 25 kWh / m<sup>2</sup> thermal).
- BENG 2: Primary fossil energy consumption in kWh per m<sup>2</sup> of surface area per year (intended requirement is a maximum of 25 kWh / m<sup>2</sup> per year primary fossil).
- BENG 3: The share of renewable energy in total of primary energy and generated energy (intended requirement minimal 50%).

## **2.2.5 Policy and agreements**

In addition to the law and regulations, there are also various agreements regarding the real estate world. This is because the government is encouraging sustainable energy and innovation from renewable energy technologies. This is in line with the European approach to the climate change.

### *2.2.5.1 Energy agreement 2013*

In 2013 ,the government and various parties concluded covenants with which they commit themselves to specific energy saving goals, this is the energy agreement (EnergieAkkoord). Main goals are an energy saving by an average of 1,5 percent per year, 100 petajoule energy savings per 2020 and an increase in the share of renewable energy generation to 14 percent in 2020 and 16 percent in 2023. A more concrete objective has been set for the built environment. These objectives are set for 2020 and arise from European EED and the EPBD and covenants (Sociaal Economische Raad, 2013):

- Existing construction: 300,000 existing dwellings and other buildings have to make at least two label steps per year;
- New construction; almost energy-neutral from 2020 (and from 2018 government buildings) in accordance with the EPBD directive;
- Rent; on average Label B in the social rent and at least label C for 80% of the social rent in 2020.
- Vision / ambition:
  - All citizen will live in 2050 in an Energy neutral dwelling;
  - In 2030, an average owner's dwelling has an energy label A;
  - The housing corporation dwellings have average energy label B in 2020;
  - The majority part of the dwellings from private landlords have energy label C in 2020.

### *2.2.5.2 Coalition agreement 2017 and Gas connection*

When examine sustainability measures, also new coalition agreements must be taken in to account. The coalition agreement of the Dutch cabinet "Rutte 3" 2017 has devote a section to the sustainability of the built environment. They indicate in this agreement that the

preservation of existing housing stock begins with the reduction of heat demand by isolation. In the long term, the remaining heat of this reduction can be provided by sustainable available resources such as solar boilers or heat pumps, a subsidy will be available for these resources. Rutte 3 ,also wants a policy program for sustainability to come from the built environment, with an efficient approach per region (NVM, 2017).

Another step towards to a sustainable future is the stop of making dwellings with gas connections. At the end of the cabinet period, new dwellings and other buildings will no longer be required to be connected with gas. An objective is to free up 30.000 to 50.000 existing dwellings per year, before the end of the cabinet period. This is the first step towards a preservation of 200.000 dwellings per year. This pace is needed to maintain the entire stock of 6 million dwellings in 30 years, till 2050 (VVD, CDA, D66 en ChristenUnie, 2017). In line with these requirements, the energy performance requirements (EPC) for new construction are further tightened (BENG). In addition, new buildings will not be connected to gas networks. A goal is to build at the end of the governments term, 50.000 new dwellings who are free from gas. The current gas connection requirement will be replaced by a "heat right". With this new right, end users are entitled to a (widened) electricity grid or a heat grid. The replacement of gas networks will be done in consultation with the municipalities (VVD, CDA, D66 en ChristenUnie, 2017).

## 2.2.6 Conclusion

The main measures with the largest "expected" effect are described. It must be stated here, on the basis, all these measures results from the Paris Agreement, in which the emissions from the built environment must be reduced. As a result, the focus is also mainly on the reduction of energy. And not on the sustainability of materials. The upcoming and most important measures are BENG and the abolition of the gas connection:

- |                    |   |
|--------------------|---|
| BENG:              | <i>From 1 January 2021, dwellings must comply to BENG 1,2 and 3.</i><br><i>BENG 1 is the maximum requirement in kWh per m<sup>2</sup> of surface area per year (25 kWh / m<sup>2</sup>)</i><br><i>BENG 2 is the maximum requirement in fossil energy consumption (25 kWh / m<sup>2</sup>)</i><br><i>BENG 3 is the minimal of 50% in the share of renewable energy in total primary energy and generated energy.</i> |
| No gas connection: | <i>The government 2017 agreement of the Dutch cabinet "Rutte 3" described that a gas connection is no longer mandatory, and dwellings must be removed from the gas grid in phases. This means that dwellings must be connection to installations such as heat sources.</i>  |

In this research, sustainable dwellings are houses with BENG. This is the basis in this research. But to measure sustainability and value at this moment, the only possible way is to look at energy labels and the difference between values of dwellings. The following chapter examines the effects of sustainable measure on the value of dwellings.

## 2.3 Value and valuation

The previous chapters describes the definition and laws regarding to sustainability. This chapter deals with the subject on how the value of dwellings is determined and how sustainability could play a role in this valuation and the value of dwellings. Sustainability is at this moment still not always included in valuations. However, it becomes clear that more and more appraisers see the value of sustainability and bring them in their appreciation. This chapter will describe market value, parameters, important valuations methods and guidelines regarding to valuation. And finally, the effects of sustainability on the value of dwellings at this moment is discussed.

### 2.3.1 Value

First of all, it must be determined what the definition of value is in this research. In this research is value the market value. The definition from the NVM Business Dutch real estate assessors EVS 2016 is used in this research. The definition of market value is "*the estimated amount for which the property should exchange on the date of valuation between a willing buyer and a willing seller in an arm's length transaction after proper marketing wherein the parties had each acted knowledgeably, prudently and without being under compulsion*" (Berkhout & Roggeveen, 2017, p. 21)

#### 2.3.1.1 Transaction price

The market value and the transaction price seems to be the same. Yet, there is also a difference between these. As already described, the market value is the estimated amount for which an item would be sold on the valuation date. The transaction price is the actual amount ultimately paid for the property. This price can, for example, vary due a very tight housing market such as Amsterdam, where people bid against each other and push up prices. In addition, there is a difference between a free-to-name price (v.o.n. price) and buyer costs (k.k). A v.o.n. price does not have any extra costs on top of the price of the dwelling, this is usually the case for new dwellings. With buyer costs, there will be transfer tax and notary fees on top of the dwelling price.

### 2.3.2 Value-determining parameters

The value of real estate is determined by various parameters. These parameters are also important when performing the hedonic valuation later in this research. The first important parameter are the building characteristics, these physical characteristics of a home are the characteristics that form the basis of the value of a home (Malpezzi, O'Sullivan, & Gibb, 2002). Within these structural characteristics, the floor surface is the most important one (Visser & van Dam, 2006). In addition to the floor surface, the total plot of the land is also important for the value of a dwelling (Sirmans, MacDonald, Macpherson, & Zietz, 2005). The age of the real estate also plays a role in the value. An older dwelling often means a negative impact. Only when a dwelling is older than 40 years of age, it could lead to an increase in value (Wilhelmsen, 2008). In addition to these characteristics, there are also characteristics

such as cellar, maintenance, number of rooms and garden. We can distinguish 5 types of dwellings, namely; terrace dwelling, end of terrace dwelling, semi-detached dwelling, detached dwelling and switched dwelling.

A second important parameter are the location characteristics. Within these parameter are variables like accessibility to the city center, distance to school, distance to the motorway, distance to public transport important (Din, Hoesli, & Bender, 2001). But also the amount of transaction in a certain location, or address density are important (Kousemaeker & Agt, 2007). Other important location aspects are, for example green areas, traffic and proximity to the center and squares. But also the view from a dwelling (Sirmans, MacDonald, Macpherson, & Zietz, 2005).

A third, and maybe the most important parameter are the city characteristics. It is often said that the city is the determining factor for the value of a home, think about the difference between Amsterdam and Vlissingen. This includes, for example, the properties of the neighborhood like the population density, age and income of the local residents and degree of urbanity (Kiel & Zabel, 2004). Chapter 3, methods, will further discuss the description and representativeness of the database and the dependent and independent variables for the hedonic price analysis.

### 2.3.3 Valuation methods and guidelines

The mentioned parameters are not the only important subject for determining the value of dwellings. There are also different methods to determine the value.. This chapter will discuss the most important methods for this research (RICS, 2012), stated in Table 1 Overview valuation methods:

*Table 1 Overview valuation methods*

Methods	Explanation
<b>The cost approach</b>	<p>These approach is linked to production costs plus the value of the ground. Within these approach there are five methods:</p> <ul style="list-style-type: none"> <li>- Surface method;</li> <li>- Construction cost method;</li> <li>- Replacement method;</li> <li>- Residual Method of valuation for land;</li> </ul> <p>For this research, the residual land value valuation is the most important and especially for the second objective. This residual land valuation method is calculated on the market value of real estate after the realization. The costs of the production will be subtracted from the market value. The residue that remains is the value of the ground (Elsevier Stokmans &amp; Haverkampf, 2011).</p>
<b>Comparative approach</b>	<p>A building is valued on the hand of comparable buildings whose rental or selling prices are known (transactions). The comparative approach compares these transactions with the property to be taxed in the same region and with same end user purpose. So this means that the transactions are as far as possible comparable so that the assessor has a correct reference for the valuation. With this method it is important that the assessor is experienced because transactions can differ significantly from what the actual value was (Elsevier Stokmans &amp; Haverkampf, 2011).</p>

When valuing dwellings, the comparative method is generally used by appraisers. This makes it best to determine the "market value". For example, a property in Amsterdam has a completely different "market value" compared with a property in Zeeland while the construction costs are often the same. In addition to these valuation methods, also the WOZ (Law on the valuation of immovable property) can be mentioned as an addition to these valuation methods. The WOZ value of a dwelling is used to determine the amount of the property tax and is determined by mean of valuation. The municipality carries out these valuations by taking the amount that the real estate should yield 1 January of the previous year (Rijksoverheid, 2018).

#### 2.3.3.1 *Guidelines*

In order to carry out the different valuation methods, appraisers must work according to international standards, these are the European Valuation Standards (EVS). The need for generally accepted and unambiguously interpretable taxation guidelines is demonstrated by the European Bank. They place the EVS on the top of the list of the valuation standards (NVM, 2016). The EVS are ensuring uniformity and quality. The EVS is the only directive that is international valid and aimed at the European law and regulation. In addition, these guidelines also comply with the condition set by the Dutch Register of Property Assessors (NRVT). In order to continue with sustainability and valuation, the European and international Directive EVS will be held. In this directive is stated that like the term sustainability, also for term "sustainable value" different terms are used. To a certain extent, this simply means that the "sustainable" qualities of a buildings will return into their value (Berkhout & Roggeveen, 2017).

### 2.3.4 Effect of sustainability on the value

Valuation methods and value determining parameters have been discussed, and it is clear that the market will play an important role in the determination of the value. At this moment, research has already been conducted about the effects of sustainable measures (energy labels) on the value of dwellings. These studies mainly focus on housing transactions of years ago. Also, uncertainty within these studies occur. Energy labels often go together with total home improvement. So these labels do not only represent sustainability.

#### 2.3.4.1 *Clear effect*

A number of studies focus on one of best measurable and comparable aspects of housing, the energy label. The study of Dirk Brounen, et al 2011 concludes that there is a non-linear link between energy labels and the value of dwellings. The results of this study shows a smaller effect on the value when the energy label change from C to B in comparison with a change from B to A. And the value effect of label A to A++ will be greater than the effect of energy label B to A (Buruma, 2017) (Brounen & Kok, 2011).

Research from Chegut et al. 2016, shows the relation between the transaction value of dwelling quality and the transaction price of corporation dwellings. This research is based on 28.500 transactions between 2003 and 2013. Approximately 42% of the dwellings in this

study was provided with an energy label. The 28.5000 transactions were obtained by linking information from the Kadaster to the information from the authority housing corporations, the NVM and Agency NL. This research shows that the quality of interior and exterior means a premium of 12,7% and 3,2% on the transaction price. And even the renovation of a label F dwelling to label A, can deliver an increase of the transaction price of almost 25% (Chegut, Eichholtz, & Holtermans, 2016).

The University of Tilburg also shows a different side, the influence of an unfavourable label. This label ensures that the sale of this dwelling will be much slower, namely 66 days than a dwelling with favourable label. The same effect can be distinguished in the sale price. The influence of the unfavourable labels is greater than the effect of a favourable label. The unfavourable labels like F and G are accompanied by a discount of almost €12.000,- while favourable labels yields €6000,- extra (Tilburg University, 2017).

#### *2.3.4.2 Unclear effect*

In May 2016, calcasa investigated the effects of energy labels on the value of dwellings. The results of this research conflict with the studies described from Brounen, et al 2011 and Chegut et al. 2016. Calcasa describes that the average price of single family and multifamily dwellings are insensitive to the energy label (Calcasa, 2016). A greener label does not lead to a higher average square meter price. It is also noticeable that dwellings with an F-label does have an average price of €2150,- per square meter while C-label dwellings were €2200,- per square meter (Business Insider, 2016). A report from the "Rekenkamer" also creates uncertainty about the influence of energy labels on the speed of sales and the prices. Their findings indicates that it is at this moment not clear that dwellings with an energy label generates more money and will be sold more quickly. The Minister of Housing and Government Service reacted on this report by saying that it is import to keep on monitoring the effect of the energy label. The expectation of this Minister is that the effects will increase if homeowners become more accustomed to this (Algemene Rekenkamer, 2016).

In addition, results of an investigation by Jon Olaussen emerged during this research. This study looked at the effect of the energy label on dwellings since the introduction in 2010. In this study, it emerged that the dwelling prices did increase since the introduction of energy labels, but Jon Olaussen shows that this price increase for sustainable dwellings already increased before the introduction of the energy label. So the price increase is due to other factors. In Olaussen's research, results emerged in which the label had effect on the price of dwellings. But when the data were studied more thoroughly, the effects disappeared. Professor Olaussen even closes his in study by saying that energy labels have no effect on the price of dwellings. He also indicates that he had serious doubt about the study of Dirk Brounen (Olaussen, 2017).

#### *2.3.4.3 Added value*

Next to the added economic value of the dwellings, also the energy savings are important for the residents and can be seen as an added value. The living environment will be better and the total housing costs will be lower. In a "hot sustainable" dwelling with a 4 person household, the gas and electricity consumption will be together around € 144, - per month (NIBUD, 2017). Looking at the BENG dwellings that are being put forward in the Spring Agreement, we see that the total costs will be € 41 per month (Rijksdienst voor Ondernemend Nederland, 2017). This is a saving of more than € 100 per month. Nevertheless, the energy savings are not yet made transparent in the determination of the value.

### **2.3.5 Conclusion**

In this study, the value of dwellings is defined as market value. This market value is influenced by a number of parameters. These parameters will be further covered in the creation of the database for the hedonic price analysis. In addition, the market value of dwellings is determined by appraisers. These appraisers determine the value largely through the price of other dwelling transactions between sellers and buyers. Contradictions exist in the literature about the effects on the value. These effects are further clarified in the results part of this study. In the hedonic price analysis is tried to give more clear results about the effects of sustainability on dwellings. The hedonic price analysis is followed by depth interviews to more clarify the effects on the value. But first, the next chapter will give an explanation about the costs of sustainable measures.

## 2.4 Costs

In order to comply with the future law and regulatory (BENG), described in the previous chapters, measures must be taken. Building parties should therefore develop, design and deliver in another way. This chapter focuses on the contractor and the costs to comply with the future measurements from the government.

### 2.4.1 Construction costs and sustainability

Construction costs generally increase every year. Also, lately, due to the improving economy, the delivery times for building materials have risen considerably (Cobouw, 2017). Jan Fokkema, director of NEPROM, indicates that the costs for energy neutral dwellings are higher than non sustainable dwellings. On an average, the costs will be €15.000,- higher per dwelling (Fokkema, 2018). A study from BBN adviseurs to the additional costs for sustainability focused on the EPC requirement of 0.4 and found additional costs of 7% for dwellings (BBN adviseurs, 2015). These results are corresponding with the results coming from the construction cost index. They indicates an increase in construction costs 6% when the EPC norm in 2011 went to 0,6 (first line in figure 1). And in 2015 de EPC standard went from 0.6 to 0.4 (second line in figure 1) and the construction costs even increased by 6 to 8%. Nevertheless, there is a special detail in the construction costs index (Vonk, de Wilde, & de Groot, 2017). The costs always rise after a tightening of the EPC standard, after a period of about two quarters there is a decline in construction costs. It is important to be able to explain this decline.

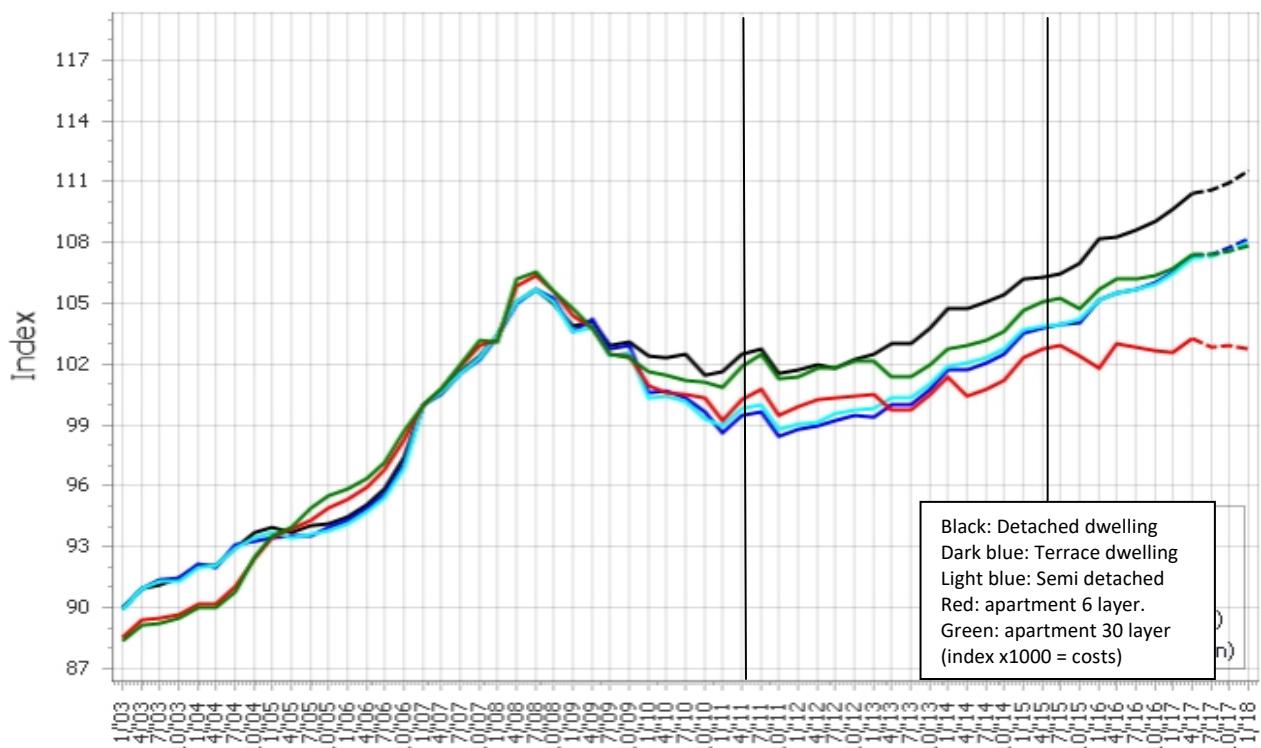


Figure 1 construction costs index. Source: (Vonk, de Wilde, & de Groot, 2017) (Edited for this research)

This reduction in building costs can have several reasons. Given reasons are related to contractors who choose to build in a different way to reduce the extra costs to built sustainable. For example, it can be seen that a less high-quality finish is chosen for standard new construction. It is also being decided to build slightly smaller dwellings, which will reduce the costs (abf research, 2017). In addition, the massive introduction of a new energy standard will result in innovation and mass production. This can lead to a more efficient handling of materials or new products, which can lead to cost reductions (van der Vooren, Reudink, & Hanemaaijer, 2015).

#### **2.4.2 Costs to comply with BENG**

A more specific view on the costs arises when focusing on the specific future measures like BENG. The costs differs from €5000,- for a simple dwelling, to €30,000,- for a large detached dwelling (LenteAkkoord, 2017). This also appears from research by Nieman consultants and DGMR construction. They have compiled an overview, Table 2 (Overview additional costs to comply with BENG), about the costs to comply these dwellings to the three BENG requirements. This comparison has been drawn in relation to a dwelling that meets an EPC of 0.4 (Nieman, DGMR Bouw B.V., 2017).

*Table 2 Overview additional costs to comply with BENG*

Type of dwelling	Additional costs per dwelling	total	Additional costs per m <sup>2</sup>
End of terrace dwelling in North-Brabant	€6.655,-	€53,-	
8 terrace dwellings in Ten post	€24.363,-	€322,-	
End of terrace dwelling with flat roof	€17.885,-	€177,-	
Basic terrace dwelling in Ter Steeg	€9.300,-	€84,-	
Basic terrace dwelling in Trebbe	€5.337,-	€49,-	

From this data it can be concluded that the costs differs per dwelling, situation and location but intermediate dwellings and dwellings with limited glass surfaces are the easiest to comply with BENG. TNO conducted a research of the costs of sustainable dwellings by monitoring energies prong. For new build dwellings, the extra costs for energy measures will be around 25% of the direct building costs. TNO indicates that the costs are still too high and can even be as high as €60.000,- at renovations. But through increasing standardization of methods and products and innovation of energy measures would be the prices for sustainability lower than they were in the projects they viewed. Also, half of the additional costs of BENG measures are attributable to a less orientations of the building to the sun (Leidelmeijer, de Wild, Borsboom, & van Vliet, 2017).

#### **2.4.3 Costs to remove dwellings from the gas grid**

The new cabinet of the Dutch Government have decided; new dwellings and other buildings will no longer be heated with gas. The will ensure that the entire stock of 6 million dwellings in 30 years will be free from a gas connection (VVD, CDA, D66 en ChristenUnie, 2017). This will certainly bring additional costs in the beginning. Because the gas connection must be

replaced, this is usually done with a heat pump. The costs of adapting the new electricity connection and the heat pump instead of the gas boiler will be together €15.000,-. As a result, "gas free" appears to be expensive, but in the long run, these costs will be less. With subsidy on installations like a heat pump and a 30 year maturity, the costs will be almost the same (Cobouw, 2017). Onno Dwars, Commercial Director of Ballast Nedam Development starts as the first big constructor with only developing dwellings without a gas connection. Onno Dwars explains that the dwellings are not getting more expensive. The extra investments in installations and other measures to make dwellings gasless are activated differently. The extra investments can be repaid in additional financing, and the energy costs will be less (FD, 2017). An important addition is that grid operators can distribute fine of more than €600,- when homeowners want to remove their home from the gas. But, dwellings does not necessarily have to be collected from the gas. However, homeowners will continue to pay network management costs of an average of €125,- per year (de Jong, 2017).

#### **2.4.4 Energy tax**

The new government agreement of 2017, indicates an increase of the energy taxes. According to the Ministry of Finance, the energy tax increases, but this increase does not have to lead to an increase of the construction cost. This is because the law on sustainable energy storage are being reduced. This tax increase is taken because energy consumption can lead to more CO<sub>2</sub> emissions. It is expected that energy consumers will deal more consciously with energy because of the higher energy taxes.

#### **2.4.5 Subsidy**

In order to stimulate sustainability and speed up the process towards energy neutral dwellings in 2050, there are various subsidy options for constructors. But there is no separate subsidy for energy-neutral constructions (Rijksdienst voor Ondernemend Nederland, 2017). In addition, there are different ways of support when building energy-neutral. For new dwellings, there are four different subsidies, namely; ISDE, EIA, GR and Banks with special mortgages (Atriensis, 2016), described in Table 3 Subsidy overview. Important for this study is the fact that the ISDE subsidies will stop in 2021, the moment BENG will start. Construction companies are using the ISDE subsidies when building sustainable. When these subsidies will stop, this will have a significant effect on the construction costs.

*Table 3 Subsidy overview*

<b>Subsidy</b>	<b>description</b>
<b>ISDE</b>	The Investment Subsidy Renewable Energy: Receive subsidy on solar boiler, heat pump, biomass boiler and pellet stove. The amount of subsidy depends on the type of device and the energy performance of the installation. Think about €1000,- for a heat pump (Rijksdienst voor ondernemend Nederland, 2017).
<b>EIA</b>	As a company, association or foundation, it is possible to invest in energy efficiency techniques and sustainable energy with the energy investment allowance (EIA)

GR	scheme and gain tax benefits. The EIA can give an average of 13,5% benefit. It is possible to deduct 55% if the investment costs from the taxable profit (Rijksdienst voor ondernemend Nederland, 2017).
Banking	The green Project Scheme is a joint arrangement between the ministries of Infrastructure and Water management, and Finance. They will stimulate sustainable and innovative construction projects. This GR arrangement is a loan option. Through the GR, a corporation has earned an interest advantage of 1% for 10 years through the realization of energy projects at a green fund or green bank (Rijksdienst voor ondernemend Nederland, 2017).

Banking	There are banks such as the triodos bank that are leaders in this. The bank indicates that they want to link energy labels to the mortgage interest rate. A higher energy label means a lower interest rate for the mortgage of your home. This could play a crucial role in the change in value of sustainable housing. The Rabobank also responds to the climate objectives and does not provide a discount based on energy labels, but is based on the level of the EPC value of a home (Rabobank, 2017). When banks easily provide higher mortgages for sustainability improvements, the willingness to pay will increase.
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#### 2.4.6 Conclusion

The contractor is the closest related stakeholder to the costs of new dwellings. These buildings must meet a number of new rules and regulations in the future, as described earlier, BENG and dwellings without a gas connection are till now the most important. It is not clear to say what the extra costs are for sustainability because it differs per dwelling. In addition, also attention must be given to the past. We see increases in the costs because the EPC tightening. But also a decrease in cost because the building industry is responding to these changes. Next to this, also the financing and subsidies are important. When the financing of sustainable improvement will get easier, the willingness to pay will increase. This will be discussed in the next paragraph. The following topics are the most important regarding to costs and sustainability:

- |                                     |  |
|-------------------------------------|--|
| Additional costs BENG:              | <i>Differs €5000,- for basic dwellings to €30.000,- for large detached dwellings. The payback time is not included in these costs.</i>   |
| Additional costs gas free buildings | <i>Costs for new electricity connection and the replacement of electronic installations for heating instead of gas boilers are around €15.000,- The payback time is not included in these costs.</i>   |
| Energy Tax Subsidy                  | <p><i>The taxes on energy will rise.</i></p> <p><i>ISDE: Subsidy on renewable energy: sun boiler, heat pump etc.(Subsidy will stop in 2021);</i></p> <p><i>EIA: Invest in energy efficiency techniques and gain tax benefits;</i></p> <p><i>GR: Stimulation of sustainable and innovative construction projects. Loan option, 1% for 10 years</i></p> <p><i>Bank will be very important in the future. When banks will provide extra mortgages on sustainable dwellings, people will choose more quickly for sustainability.</i></p> |

## **2.5 Market and sustainability**

As indicated earlier in this research, the market value is the value that is used in this research. The market is an import factor in influencing the value of sustainability. The awareness of choosing and paying for sustainability is also increasing (Anker, 2016). To sustain the built environment and reduce emissions, it is important to know how many and why people are willing to pay for sustainability.

### **2.5.1 Willingness to pay for sustainability**

Research from The Nielsen Global Survey of Corporate Social Responsibility 2015 shows that each year, the willingness to pay for sustainability increases. In 2013 this was 50% of respondents, in 2014 it was 55% and in 66% by 2015. It is evident that awareness of the importance of sustainability is increasing, especially for millennials, the target group with the highest willingness is 73 percent (Nielsen, 2015). A research by Goos Marketing Research commissioned by Triodos Bank shows that Dutch consumers are willing to pay more for products labelled as sustainable. From this market survey among 1152 respondents, it appears that 85% of respondents are interested in sustainable products. But only if the price is as much as that of non-sustainable products. Within this group, 42% are willing to pay for sustainability if the price of this product is up to 10% higher (GOOS Marketing Research, 2017). In the investor world, interest in sustainability is gaining more and more territory. The Schroder Global Investor Study 2017 states that investors are becoming increasingly aware of the importance of sustainable investment. Schroders states in his study that 72% of Dutch surveyors who invest in sustainable, investment in sustainability is for them now more important than five years ago, this is 78% worldwide (Schroders, 2017). This is because their real estate will be better rentable and more courageous when they are sustainable (Jelyta, 2017).

### **2.5.2 Willingness to pay for sustainable real estate**

The importance of creating sustainable real estate is that it is not only about the environment and the future generation, but also that the current property user will benefits from sustainability. According to Annemarie van Doorn, director of the Dutch Green Building Council, costs can be saved on energy, but also on cleaning, tax and landfills (Rijke, 2017). Within the built environment, a distinction can be made between commercial and private real estate.

#### *2.5.2.1 Commercial real estate*

In 2010, Jones Lang LaSalle (JLL) conducted an investigation into the willingness of organizations to pay a premium for sustainable housing. The willingness to pay for sustainable housing has risen from 74% in 2008 to 83% in 2010. For 70% of these surveyors, here's the premium they want to pay for sustainability between 1% and 5%. Also, 70% of office users indicate that both, the tenant and the landlord must share the financial benefits

achieved. In addition, JLL indicates in this research that the government must provide more clarity about sustainability and implement measures to promote sustainable housing within 5 years (JLL, 2010). This last point has already been formally given by the government, among other things like BENG and the energy agreement. Since January 1, 2015, a valid energy label is required for the sale, rental and delivery of dwellings and business buildings. And after 2023, office buildings without label C are nothing worth anymore because they may no longer be leased (Grol & Rooijers, 2017).

#### *2.5.2.2 Rental properties*

The energy agreement states that, in 2020, dwellings of corporations have an average energy label B (Milieudefensie, 2016). So housing corporation have to take action. Some examples in Eindhoven are housing Corporation Residential Company and “at home” have sustainability plans to achieve their CO<sub>2</sub> emissions. They will do this by allowing tenants themselves to place solar panels in their dwellings. Here the tenants pay a fixed amount per month, but because the tenant's energy bill goes down, they are financially advancing. The objective of these housing corporations is to provide more than 10,000 dwellings with solar panels over the next 10 years. About 20% of the tenants has already stated that they want to accept this offer (aedes, 2017). Another housing corporation that in an affordable and attractive way, achieves sustainability is SallandWonen. Tenants have indicated through a survey what the most important assignments for both tenants and landlords are, which included diligence and the provision of affordable housing. This involves the corporation through free facade insulation and insulation glass. Also, solar panels will be placed where it is possible. In addition, the housing corporation has reduced the rent for roof and floor insulation. When renters already pay the maximum rent, no rent increase is requested (SallandWonen, 2017).

#### *2.5.2.3 Owner properties*

A research from Bouwfonds in 2010 shows that, notwithstanding the payback period, half of the potential real estate buyers have not yet been prepared to pay € 5000,- extra. If it has been proven that an energy-efficient investment provides a lower energy bill and the return period is guaranteed, more than 62% want to pay an additional cost of € 15,000. And even 50% of potential buyers of new-build dwellings over € 400,000 would be willing to invest €30,000 if this amount would be returned within 10 years (Bouwfond ontwikkeling, 2010). In 2015, USP Marketing & Consultancy presented various questions to government professionals, engineers, consultants, developers and builders about consumers and energy savings: why consumers would take energy-saving measures. This made it very clear that these professionals think that residential consumers are taking energy-saving measures to obtain a lower energy bill. A second and third reason are getting subsidy and additional living comfort (van de Griendt, 2015). Based on the survey of The Nielsen Global Survey of Corporate Social Responsibility 2015, it also appears that the willingness to pay for sustainability is related to age. Millennials appear to be most willing to pay extra for sustainable real estate offerings. CBRE suggests that green housing opportunities will

become increasingly popular (CBRE, 2017). This is also evidenced by research by F. Encinas et al. 2016, showing results of their regression analysis that households with young children want to pay the most for sustainability, these are also often millenials (Encinas, Marmolejo, Sanchez, & Aguirre, 2016). Building energy neutral housing is already happening and interest increases, but is still not the standard. An estimated 10% of the dwellings being built are energy neutral (Rijksdienst voor ondernemend Nederland, 2015).

#### *2.5.2.4 Stimulation now and in the future*

Different funding opportunities are created to encourage housing to be renewable and renewable. Examples of this are zero-on-the-meter, subscriber forms and subsidies. "Zero on the meter" stands for a home where the annual energy consumption is zero. To make a Zero on the Meter renovation on a property, the homeowner can apply for a loan from a financing institution. The amount of this loan requested is equal to the present value of the amount that the homeowner should pay for his energy company for a specified period. This ensures that the living expenses will, in principle, remain the same, but the homeowner does have a home that is energy neutral. And energy-neutral is in many cases also more comfortable (Beroepsopleiding Makelaars, 2017). The government is an important player when it comes to stimulating and awareness of the importance of sustainability. The government therefore often chooses to do this in the form of grants. This usually happens only temporarily to trigger a move towards a particular goal. If a specific solution is subsidized for a long time, there may be a delay in developing new possible solutions, and for example, only certain consumers are favored (de Reus, 2017).

#### **2.5.3 Conclusion**

The market determines the price. If the market does not want to pay for sustainability, sustainability will not be seen in the value of real estate either. The willingness to pay for sustainability is growing and especially for millenials. But only when the costs will be the same through a clear payback period, it is striking that people opt for sustainable measures more easily. Next to this, it can be seen that housing corporations are making their dwellings more sustainable. Their tenants pay for the costs, but because the energy bills will be lower, their total housingcosts will be the same. This form of making dwellings more sustainable can also be seen in stimulations projects like Zero On the Meter. The following chapter will explain how the market and sustainability is related to the land value.

## **2.6 Land value and sustainability**

This last chapter of the theoretical framework serves as the theoretical background for the final advice for Gloudemans and the second research goal; “advice Gloudemans on how to deal with sustainability and land value”. When there is more clarity about the costs and yields of sustainable housing, more can be said possible effect on the land value, when it is calculated with residual land value method. The relation between sustainability and land value (provision) for new dwellings is difficult and not totally tangible at the moment. Firstly, the definitions of land price and land value will be explained. Hereafter, the valuation of land prices will be determined. Finally, the effect on land value will be explained.

### **2.6.1 Definitions**

In order to understand how land values arise and how there can be an effect of sustainability on land value, the definition must first be clear. There is a difference between the land value and the land price. Both definitions are explained.

#### *2.6.1.1 land value*

The land value is the value that the municipality or developer itself couples to the ground. This is the value that they value to the land (Ten Have, 2002). This is the research objective in this study.

#### *2.6.1.2 Land price*

Land price can be seen as the price that eventually arises after negotiations between the landowner (usually the municipality) and the buyer (usually the developer). The transaction price is the price that was ultimately paid for the land. This is the finally the price of the land (Ten Have, 2002).

### **2.6.2 Land value for new dwellings**

The "value" of the land is determined by various factors. The scarcity of the land and the resulting value is determined by the function or destination of the land, the accessibility, the condition, the location and the associated demand for this land from the market. But ultimately the land value is determined by the owner, this often the municipality. To determine the price of the land, there are several methods, they will be discussed in the following section. But for new dwellings, the most obvious way is that an independent party determines the value of the land for a municipality. This is Gloudemans for example. The value must be in line with market conditions, it is therefore not allowed to just link a value to a piece of land. And this value is often determined with the residual land value calculation. This method will be discussed in the following paragraph.

### **2.6.3 Valuation of land value.**

Determining value of land can be done in different ways and methods. Depending on the choice of methodology, the risk profile may also vary for governments. It is important to

know that land value always remains a function of supply and demand. The following methods are available according to (Wolting, 2008);

- Comparative pricing: The land value is determined based on a comparison with other plots of land, which have the same function and / or location;
- Residual method of valuation for land: The residual method is the most used by public and private parties when it comes to a transparent and market-based land value. This method is in this research the method to determine land value. A groundletter results often from the residual method: A municipality decides the new land value policy, based on the municipal budget policy document. It is the task of the municipality to contribute to a stable development of the real estate market. That is why land value policy will be based on market based land values. These values are often determined by the residual method.

#### *2.6.3.1 Residual method and determining parameters*

The land value is determined as a residual by reducing the market value (the commercial price of a dwelling) with construction costs (including additional costs like profit and risk). The residual value is found when using the following equation (Robinson, 2005): Land value = value (Market value of a dwelling) – Costs (Building + Finance + Marketing + Profit). The value and costs in the equation can be seen as the parameters for the determination of land. The previous chapters shows how sustainable measures can affect the construction costs of dwelling, so in this way sustainability is linked to the land value. Therefore, the residual method of valuation for land is the most suitable method for measuring the effect of sustainability on the land. Advantages of this method are therefore; an accurate relationship between land value and the dwelling value. But also the transparency towards market parties ensures better negotiations that become more transparent, so it will be clear which buttons needs to be turned (Liem, 2016).

#### *2.6.3.2 Effect on the land: Assumption*

Figure 2 shows how the value of land has been determined. And also shows the effect what happens if the market value of dwelling remains the same, but construction will increase because of sustainability measures (from left to right).

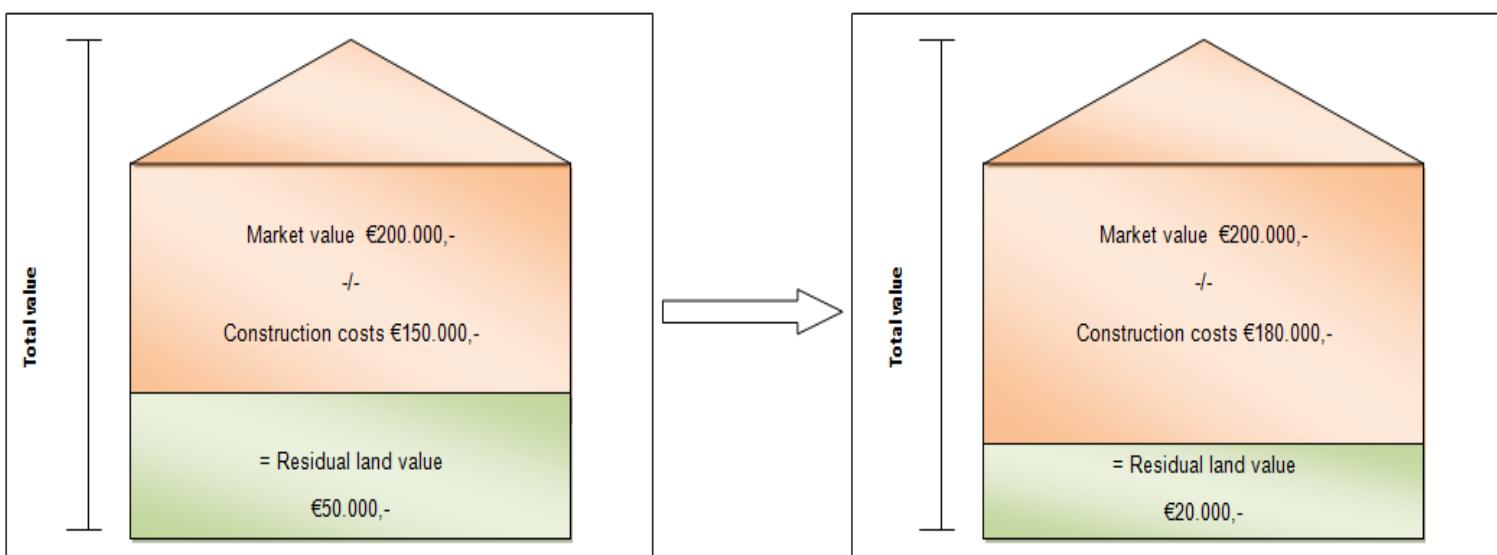


Figure 2: Effect of extra construction costs on the land value

## **2.6.4 Sustainability and land value**

The relationship between land value and sustainability seems to be quite far apart. Nevertheless, the first relation between sustainability and land value is already described in the previous paragraph. This section focuses on what already is known in the literature. To find multiple relationships, the topic is divided into two parts. Namely the land values before 1 January 2020 (before the obligation of BENG) and land values after 1 January 2020 (after the obligation of BENG).

### *2.6.4.1 Before 1 January 2020*

Before 1 January 2020 are less obligations regarding to sustainable housing. Dwellings do not have to comply to BENG and do not have to be removed from the gas grid. So, builders / contractors are not yet obliged to build sustainable under more strict norms at this moment. Therefore sometimes municipalities choose to encourage sustainable construction. This stimulation is necessary because sustainable dwellings are still at this moment more expensive to build with an effect of a higher VON price. And therefore, they are more difficult to sell on the market because the willingness to pay for sustainability is often limited at this moment (Smoor, 2016). This willingness to pay is affecting contractors, for them it is less attractive to build sustainable dwellings. When the municipality will lower the land value, the property can be offered for almost the same VOP price as non sustainable dwellings. But at this moment, there is also a different effect. Namely, dwelling prices have risen sharply again this year. Transaction in municipalities such as Amsterdam, Delft and Leiden fell by about 15%, but the average dwelling prices rose by almost 10% in the third quarter of 2017 (NVM, 2017). The municipality is taking part in this rise in dwelling prices. When using the residual land values method, the residue will be higher when a dwelling yields more. Liem 2016, did research about land values of offices. In this, research, also the residual methods was used, the calculation shows that the residual value of sustainable offices (label A) are between 7% and 9% lower than an office that is accordance with the buildings decree (Liem, 2016).

### *2.6.4.2 After 1 January 2020*

After 1 January 2020, the contractors / builders are obliged to build sustainable. This seems to create a totally different situation. It is no longer necessary to stimulate sustainability, and therefore will be differently handled because the higher construction costs for sustainable buildings. This does not mean that sustainability no longer has any effect on the land value. A negative effect that can occur is that the construction costs continues to rise, and with extra costs to make dwellings complying to rules and regulation regarding sustainability, the total VON price of dwellings will become higher when municipalities will keep the land value high. This will mean that certain groups such as starters cannot buy a new and sustainable dwelling (NVM, 2017). The contractors will not be the one to lower their profit margin, and so the municipality will or have to play a role as they want starters to be able to by new dwellings. A reduction in land value would help municipalities to keep dwellings affordable for some groups.

But positive effects can also occur in the future. At this moment when calculating the land value, the main focus is on direct costs, like the costs of realizing a sustainable dwelling. This is also highlighted in this research, especially when the land value is calculated by the residual land value method. But in addition to these extra costs, positive effects also arise. The expectation in the literature is that the sustainable dwellings will have a certain added value. And it also appears that maintenance costs and operating costs for sustainable buildings are often lower. More attention should also be paid to indirect costs, for example the comfort of the home that will increases. This effect will not yet translate to the land value because the initial investment amount and the residual value are taken into account. If we look at the net present value of energy savings, comfort and lifespan, a higher land value can be requested (de Kort, Ploem, & Art, 2014).

### **2.6.5 Conclusion**

Land values are faced with sustainability on the bottom line. Calculating with the residual land value method means that additional costs for sustainable measures, ultimately also provide a more expensive total "value" for the dwelling and the land. Municipalities can provide stimulation, so these dwellings will not become more expensive by lowering land values. For example, when a municipality gives a discount on the land, the total price of sustainable dwellings will remain the same. But in the future, dwellings have to meet new sustainability requirements. So a stimulation is not necessary. Still, it could be that dwellings are not affordable for certain groups, and there will be a need for stimulation. On the other hand, the benefits of sustainability need to be better promoted and funded. Similarly, more expensive sustainable dwellings can be sold easier and no stimulation is needed. The following chapter will analyze the most important findings from the theory.

## 2.7 Theoretical analysis

A brief conclusion is given under each paragraph in the theoretical framework. The most important and relevant results regarding to this research are stated in these brief conclusions. In this theoretical analysis, first answers can be given to the descriptive sub-questions. Important aspects also emerge, such as operationalizing the subject of sustainability. In addition, it has become clear which laws and regulations will influence the costs and value of dwellings in the future. The impact of sustainability on the value of dwellings is still unclear due to the contradictions in the literature. This also applies to the costs of sustainable measures. The market cannot be predicted, but the theory does provide a good picture of how the market is developing. Answering the main question is not yet possible after this theoretical analysis, therefore other methods have been used to clarify the ambiguities. What sustainability does with the value of dwellings at this moment is examined by statistical research. The possible costs for sustainable measures in the future, and the value effects of sustainability in the future, will be examined more intensively through in-depth interviews. There should also be more clarity about the effects of the sustainable measures on land value. Statistical research into the effects of sustainability on land values is not possible, which is why this was also included in the interviews.

### 2.7.1 First results

Literature has been used to answer the descriptive sub-questions. This first answering of the sub-questions will be supplemented after the quantitative and qualitative research parts. But, first for performing the methodologies, the definition of sustainability in this research is important.

#### 2.7.1.1 *How is sustainability operationalized in this research?*

In this research, sustainability has been operationalized in two ways because mixed methods used in this research. The first method examines the current effects of sustainability on the value of housing, the second method examines the future effect of sustainability on dwellings. From the theory, we can operationalize sustainability for both, current and future effects on dwellings. For the first method, sustainability is operationalized on basis of the energy label. The energy label is the only certification with which dwellings, in the field of sustainability can be compared in an objective way. A note is that the energy label is only a small part of the concept sustainability. For the future effects, sustainability is operationalized as BENG and gasless, these are the future measures that will be mandatory and central in this research.

#### 2.7.1.2 *Future law and regulation regarding to sustainability for new dwellings*

The most important requirements with regard to sustainability are BENG (from 1 January 2020) and gasless dwellings. These are the most concrete future requirements that can affect the value of dwellings. They will lead to changes in the construction of dwellings and probably to extra construction costs. BENG has three requirements, the first requirement is

a maximum energy requirement of 25 kWh per m<sup>2</sup> per year. The second requirement is a maximum primary fossil energy consumption of 25 kWh per m<sup>2</sup> per year. The last BENG requirement is a share of minimal 50% of renewable energy in total of primary energy and generated energy. The extra costs to make new dwellings comply to BENG are still not really clear. It totally depends per dwelling but can reach up to €30.000,-. Gas-free is even less concrete but it is already promoted by the government. The indication of the costs to replace the gas connection by a heat pump are now around €15.000,-. These costs can however be earned back within a certain period of time since the heat pump is more economical.

#### *2.7.1.3 How is the value determined and what are the parameters?*

At first the value is determined as the market value; “*This is the estimated amount for which the property should exchange on the date of valuation between a willing buyer and a willing seller* (Berkhout & Roggeveen, 2017, p. 21)”. The value is determined by a number of parameters, these parameters will form the basis of the hedonic price analysis. The conceptual model that belongs to this hedonic price analysis is described in the next paragraph. The parameters arise from the literature. The most important parameters can be found in the building characteristics, Locations characteristics and City characteristics.

#### *2.7.1.4 What are the current effects of sustainability on dwellings and land?*

A number of important studies have been conducted with regard to sustainability and the value of dwellings. The research of Dirk Brounen is one of this studies. The results of this study shows a smaller effect on the value when the energy label change from C to B in comparison with a change from B to A. And the value effect of label A to A++ will be greater than the effect of energy label B to A (Buruma, 2017) (Brounen & Kok, 2011). Research from Chegut et al. 2016 shows that the renovation of a label F dwelling to label A, can deliver an increase of the transaction price of almost 25% (Chegut, Eichholtz, & Holtermans, 2016). But also inconsistencies between the investigation occur. Research from Calcasa. 2016 and the "Rekenkamer" shows that it is not clear that energy labels generates a higher value of a dwelling. The "Rekenkamer" shows that there is a lack of supervision and that this not benefit reliability.

#### *2.7.1.5 How is the value of land currently determined and what are the affecting parameters?*

In this research, the residual land valuation will be used for determining the land value. This is the best way to measure sustainability. Municipalities are often the sellers of land. This value for the land is determined by independent parties such as Gloudemans. This is to prevent that municipalities just determine a value for the land (Nozeman, 2010). This price determination is often done by the residual land value method. Parameters in this method are; construction costs of dwellings, profit of dwellings and the market value of dwellings. Construction costs and market value are related to sustainability because of the "extra" construction costs to build sustainable and the possible value change of dwellings.

## 2.7.2 Conceptual model hedonic price analysis

In addition to answering these sub-questions, a conceptual model can be drawn up from the theoretical framework, Figure 3: Conceptual model. It is needed to draw up a conceptual model when a subject needs to be tested. Sustainability is the independent variable that is being tested. It examines whether sustainability has an effect on the value of new dwellings and land value. As a result, the value of the dwelling is the dependent variable in this study. To quantitatively measure sustainability, the energy label is the best measurable and objective factor for testing sustainability. The other variables are needed to explain the impact of sustainability (energy label).

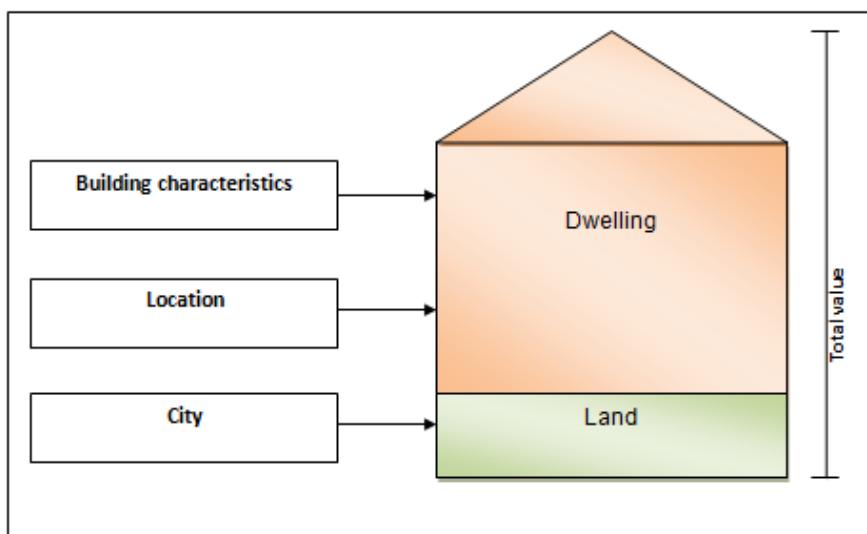


Figure 3: Conceptual model

## 2.7.3 Stakeholders

From the theory, a number of important stakeholders emerged who are related to sustainability and the effect on the value of dwellings and land value. The stakeholders in table 4 are the interviewees that will be interviewed in the qualitative part of this research.

Table 4 Stakeholders for quantitative research

Stakeholders	
Government	The governments are the one who designs the rules and regulation regarding to sustainability. Municipalities are the stakeholders who determines the land value in a land price letter. This will make them an important stakeholders to interview.
Consultancy	During the literature, articles are used that are drawn up by consultancy firms and advisors. These stakeholder already carried out various studies related to sustainability, value, real estate and land value. This allows them to provide extra depth and additional insights into this research.
Assessors	The assessor is the stakeholder who determine the value of dwellings. This make them an important stakeholder to interview. They are experts in the field of valuation and will be able to give a vision about the value of dwellings and sustainability.
Contractor	The contractor has an important role in the valuation of sustainable dwellings. The contractor is the one who usually charge the (extra) construction costs to the buyer a dwelling. When there is no innovation from the contractor, the buildings costs will stay higher for sustainable dwellings. It will therefore be a very good addition to add the vision of the contractor to this study.

### **3 Method**

The theoretical framework forms the basis for the methodological structure and the conceptual framework. First of all, this chapter starts with an introduction to the research design and strategies. In this research, two methods were used, namely a qualitative research part, and a quantitative research part. Both methods will be described in detail, in which the research approach, development and design will be discussed. Next, for every method, the data collection is described and the results generated by this method will be discussed in separate chapters. Finally, the methods will be concluded in a discussion chapter, in which the usability, reliability and the validity of the methods will be discussed.

#### **3.1 Introduction**

This empirical part of the research consist of two methods, a qualitative and quantitative research. Both forms can be seen as the strategy of this research. This study investigates whether sustainability influences the value of dwellings and land. Firstly, a qualitative research strategy was chosen because sustainability is operationalized as the future measures (BENG and gasless) for dwellings. These measures will be introduced after 2020 and are therefore not quantitatively measurable. However, it is possible to look at the vision, experience and feelings of stakeholders who have to deal with these measures. On the basis of literature, parties have emerged who are faced with the new sustainability measures. Semi-structured interviews were conducted in this study in order to produce a broad vision.

In order to obtain more concrete results in addition to a vision, experiences and feelings, the research is supplemented with quantitative research. This will increase the validity of this research because mixed methods are used. The book by Roelen & Camfield 2015 indicates that the advantages of combining qualitative and quantitative research are only possible if they can investigate the same topic with a different approach. Both strategies are used in this study to investigate the effects of sustainability on the value of dwellings. This will make the final results more usable and the sub-questions can be answered more clearly (Roelen & Camfield, 2015).

In the quantitative part will be researched what effects already are visible from sustainable measures on the transaction price of dwellings (this is the price included with land). Statistical testing will look at which factors influence the value of dwellings and what the role of the sustainability measures is. This will be done by a hedonic price analysis. The factors that can influence the price of dwellings are emerged from the theory, this resulted in a conceptual model. In order to get a wide and clear view of the effects of sustainability on the transaction price of dwellings at this moment, all the sold dwellings in quartile 3 and 4 of 2017 are used for the dataset. Because sustainability cannot yet be measured on the basis of the measures that will be taken in the future (BENG and Gasless), sustainability must be operationalized differently for the quantitative part. Energy labels are used for the quantitative part. This is currently the best measurable and standardized measure to

measure sustainability in quantitative research (Brounen & Kok, 2011). This means that for each strategy a different definition is used for sustainability. This would not hardly affect the validity of this research because both strategies will answer a different sub-question. And both will help to answer the main question.

### **3.2 Research methods**

A research method is defined as a technique for collecting data (Baarda & de Goede, 2006). In this study, three methods are used to answer the main question. The first method is the theoretical framework, this study forms the basis of the research and the conceptual model. The statistical analysis, hedonic price analysis, is the second method and is based on the conceptual model. The third method are the semi-structured interviews. The interviewees are emerged after an analysis of the theory.

In fact, the first part of this research can be seen as a testing an deductive study. In the literary part of the research, the existing theory is tested with regard to the formulated main and sub-questions. In this testing section, enough information was found with regard to sustainability and effect on the value new dwellings and land value. Because there is information in the literature about the effects of sustainability on dwellings, but this information is contradictory and therefore a hedonic price analysis has been carried out. And to assess the future impact of the sustainability measures in the future on the value of new dwellings, semi-structured interviews are conducted. This can be seen as an exploratory and inductive study because with these interviews is tried to get a clear view about the effects in the future. The inductive character of the qualitative part leaves space for a broader vision and more creativity with regard to the research subject (Lanen, 2010).

#### **3.2.1 Reading guide**

First of all, the quantitative method will be discussed in chapter 4 and will introduce the hedonic price analysis. After this, the databases and the representativeness of these databases is discussed. Within this paragraph, the used variables in the hedonic price analysis are discussed. This starts with explaining the independent variable, hereafter the various independent variables are discussed. This will be concluded with statistical testing of the databases. Hereafter, the results of the quantitative analysis are discussed ended with a conclusion. The second method is qualitative, this method will be discussed in chapter 5. This chapter starts with an introduction, after which the interviewees are discussed, these are divided into four categories, namely; policy, advice, the market and contractor and developers. After this, the dataset is discussed. The results of the qualitative research are discussed after the introduction.

Chapter 6 is the discussion of both research methods. The chapter interpret the implication of the results. The results are explained by linking them to the results found in the theoretical framework. Limitations of the research and alternative explanations of the results are given. The discussion ends with a comment on the importance of the findings.

## 4 Quantitative research: Hedonic price analysis

The hedonic price analysis will be used to answer the fourth sub question; *What is the current effect of sustainability on the value of dwellings and land?* This chapter first introduces the hedonic price analysis. Hereafter, the dataset will be discussed followed by the results of the analysis.

### 4.1 Introduction

This hedonic price analysis is conducted in order to strengthen and more clarify the results from the theory and get a current view of the effects of sustainability on the value dwellings. The hedonic price analysis is a way to derive values in measurable prices and quantities. In the NVM database, energy labels and prices of dwellings are available, this makes it possible to see a difference in prices of "non-sustainable" and "sustainable" dwellings.

An hedonic price analysis is basically a multiple regression analysis. In this research, the price (transaction price) is predicted by independent variables that are classified into the following attributes: price attributes, building attributes, city attributes, and location attributes. The aspect of sustainability falls under the category of building attributes. The dependent variable is the "transaction price" of dwellings. The hedonic pricing model has as output regression coefficients. These give insight as to the influence of the independent variables on dependent variable. The formula that belongs to this data method can be written as:

$$y = B^0 + \beta_1 X_1^i + \beta_2 X_2^i + \dots \varepsilon^i$$

The Y is the dependent value what is being predicted or explained.  $B^0$  is the constant and is the expected mean value of Y when all the X has a value of zero. The last part concerns the residue ( $\varepsilon^i$ ), this is the unexplained part of the model. This is the part that can arise because of errors in variables. The R2 determination coefficient must explain the model. From Gloudemans, there is access to various quantitative databases. These will be explained in the next section.

### 4.2 Database

This section elaborates on the dataset that was used for the hedonic price analysis. The sub-question to be answered in this hedonic price analysis is about the current effect of sustainability on dwellings. To get the best results, it was decided to only look at dwelling and not include apartments. In addition, first new dwellings were researched. This makes it very difficult to compare dwellings, because many new dwellings correspond to each other because they are built together with many dwellings in a neighborhood. In order to get a better picture of the most current effects of energy labels on the value of dwellings, the selection has been changed to all dwellings sold in quartile 3 and 4 in 2017. To obtain data about dwellings and prices, the database of the Dutch Association of Realtors (NVM) is used. All the data was manually downloaded per province and quartile via the NVM program "realworks" and merged. This dataset concludes a lot of information about the dwelling characteristics like size and energy label but also the dwelling address and characteristics of

the transactions (Table 5 Variables Hedonic analysis). The dwelling data is about dwellings in the Netherlands who are transferred in quartile 3 (1 July till 31 September) and quartile 4 (1 October till 31 December) in 2017. This is to give a clear and current view of the price developments in the real estate market. Because information from the NVM and "realworks" database is very detailed, also the zip codes from every transaction is available. This makes it possible to use zip code based data from the Central Bureau of Statistics (CBS). Because the available information from the CBS is on zip code level it can be merged with the NVM database. The available 2017 CBS data contains information about housing density, number of addresses within a kilometer radius and information about the density.

First of all, the representativeness of the dataset is discussed. Here it is checked whether the data is a correct reflection of the target population. The variables are further explained using descriptive statistics. Finally, assumptions will be explained, followed by the results.

*Table 5 Variables Hedonic analysis*

<i>Variable</i>	<i>Variables</i>	<i>Source</i>	<i>Type database</i>
Price attributes	Transaction price (total and per m <sup>2</sup> )	Real works (NVM)	Transaction database all dwellings q 3, q4 2017
	Selling period (Q3/Q4)	Real works (NVM)	Transaction database all dwellings q 3, q4 2017
	Days on the market	Real works (NVM)	Transaction database all dwellings q 3, q4 2017
Building attributes	Type of dwelling	Real works (NVM)	Transaction database all dwellings q 3, q4 2017
	Living surface	Real works (NVM)	Transaction database all dwellings q 3, q4 2017
	Plot of land	Real works (NVM)	Transaction database all dwellings q 3, q4 2017
	Construction year	Real works (NVM)	Transaction database all dwellings q 3, q4 2017
	Energy labels	Real works (NVM)works	Transaction database all dwellings q 3, q4 2017
	Content of dwelling	Real works (NVM)	Transaction database all dwellings q 3, q4 2017
	Quality of dwelling	Real works (NVM)	Transaction database all dwellings q 3, q4 2017
	Number of inhabitants per city / zip code	CBS	Population per zip code on 1 January 2017
City attributes	Population density	CBS	Population per zip code on 1 January 2017
	Coverage percentage	CBS	Population per zip code on 1 January 2017
	Degree of urbanity	CBS	Population per zip code on 1 January 2017
	Amount of transactions	NVM	Database quarterly numbers
Location attributes	Address details	Real works (NVM)	Transaction database all dwellings q 3, q4 2017
	Type of location (Province and municipality)	Real works (NVM)	Transaction database all dwellings q 3, q4 2017
	Address density	CBS	Population per zip code on 1 January 2017

#### 4.2.1 Representativeness of two regression models

The representativeness, or the population validity, is the degree to which the finding is a correct representation of the target population of this study. The amount of data bases suitable for hedonic price analysis depends per study, see Table 6 (Cases per data base), for example, Gao et al (2007) uses totally 453 cases in their study, while C, Cox (2017) 333 cases used. Other studies are from Brounen et al., 2011 and Gao et al., 2017 uses more than 150.000 cases.

Table 6 Cases per data base

Article	Cases
Liebelt et al., 2018	261.827
Brounen et al., 2011	194.379
Gao et al., 2007	453
C. Cox 2017	333

Because in this research is opted to investigate all dwellings sold in quartile 3 and 4. This results in a total dataset of 69.879 cases. 44.121 cases does not have a label, which is strange because the label is mandatory when a dwelling sold. 27.066 cases does have an energy label. After contact with the NVM, it appears that the NVM get their data from real estate brokers. And that most of these dwellings do have a label, but this has not been passed properly in to the dataset. To get the best dataset as possible, it was decided to test the model (1) with an incomplete database, and to test the model (2) in which the dwellings without a label were removed.

Table 7 Frequency data distribution model 1: all data: Source: NVM database transaction Q3/Q4

Dataset: Model 1	Frequency	Percent
Model 1	Drenthe	2756
	Flevoland	2264
	Friesland	3351
	Gelderland	9976
	Groningen	2326
	Limburg	3942
	N-Brabant	12612
	N-Holland	8333
	Overijssel	5303
	Utrecht	5330
	Z-Holland	11475
	Zeeland	2211
<b>Total</b>		<b>100,0</b>

Table 8 Frequency data distribution model 2: only dwellings with label: Source: NVM database transaction Q3/ Q4

Dataset: Model 2		Frequency	Percent
Model 2	Drenthe	1112	4,3
	Flevoland	914	3,5
	Friesland	1176	4,6
	Gelderland	3977	15,4
	Groningen	901	3,5
	Limburg	1269	4,9
	N-Brabant	4468	17,3
	N-Holland	3190	12,4
	Overijssel	1980	7,7
	Utrecht	2157	8,4
Z-Holland		3898	15,1
Zeeland		716	2,8
<b>Total</b>		<b>25758</b>	<b>100,0</b>

To test the representativeness of the sample, this dataset was compared with the whole housing market and if it is spread throughout the Netherlands. In the tables 7 and 8: Frequency data distribution model 1 and 2, the data distribution through the Netherlands is presented. Both dataset present a logically data distribution of dwelling transactions.

#### 4.2.2 Dependent variable

In this research, the value of a dwelling is the main focus. This value is defined as the market value. To know the market value of a property, often the transaction price is used. The transaction price is the price that is paid between the selling and the buying party. The total transaction price of dwellings is available, and the transaction price per m<sup>2</sup>.

Transaction price directly creates the market value of a dwelling and gives the most relevant price level. This transaction price also indicates the actual value of a dwelling at this moment. The NVM transaction database has been made available by Gloudemans. This database includes all transactions of dwellings. To give the most recent image of the housing market, it is chosen to get the database of dwellings sold in quartile 3 and 4 of 2017. In this database, the incomplete transactions have been filtered out, this results in a total of 69.879 cases. Table 9 Price per model: Source: NVM database transaction Q3/ Q4 shows the average dwelling price per research model. The second model is much smaller, but contains only dwellings with an energy label. The average prices do not differ much from each other. Both models are valid.

Table 9 Price per model: Source: NVM database transaction Q3/ Q4

Dataset	Average asking price	Average transaction price	Average asking price m <sup>2</sup>	Average transaction price m <sup>2</sup>
Model 1	€266.401,-	€262.632,-	€2418,-	€2382,-
Model 2	€263.529,-	€260.544,-	€2216,-	€2195,-

Other price variables in this data base are selling conditions. These are Costs buyer (K.K) and free on name (VON) price. K.K is for almost every 'not new' dwelling. All the new dwellings have a free on name (VON) price. The last price variable is days on the market. It is possible that a dwelling that has been on sale for a long time has dropped in price.

#### 4.2.3 Independent variables

The conceptual model has already divided the independent variables based on 3 attributes. These attributes are building, city and location. This paragraph operationalizes and describes the independent variables in more detail using descriptive statistics per type of attribute.

##### ***Building characteristics***

- *Construction year;*
- *Type of dwelling;*
- *Floor surface;*
- *Plot of land;*
- *Content of dwelling;*
- *Quality of the dwelling.*
- *Energy label.*

The construction year of a building is often important for the technical and functional aging. Older dwellings often means a negative impact. In the literature can be found that dwellings older than 40 years can lead to an increase in value. That can also be seen in dwellings built around 1930. These dwellings are very popular at the moment. This can be explained by the special architecture and more atmosphere of the dwellings (Hulsman, 2016). Figure 4 model 1. Distribution construction year. Source: NVM database transaction Q3/ Q4 shows the distribution of the construction years. And the average age is 1977.

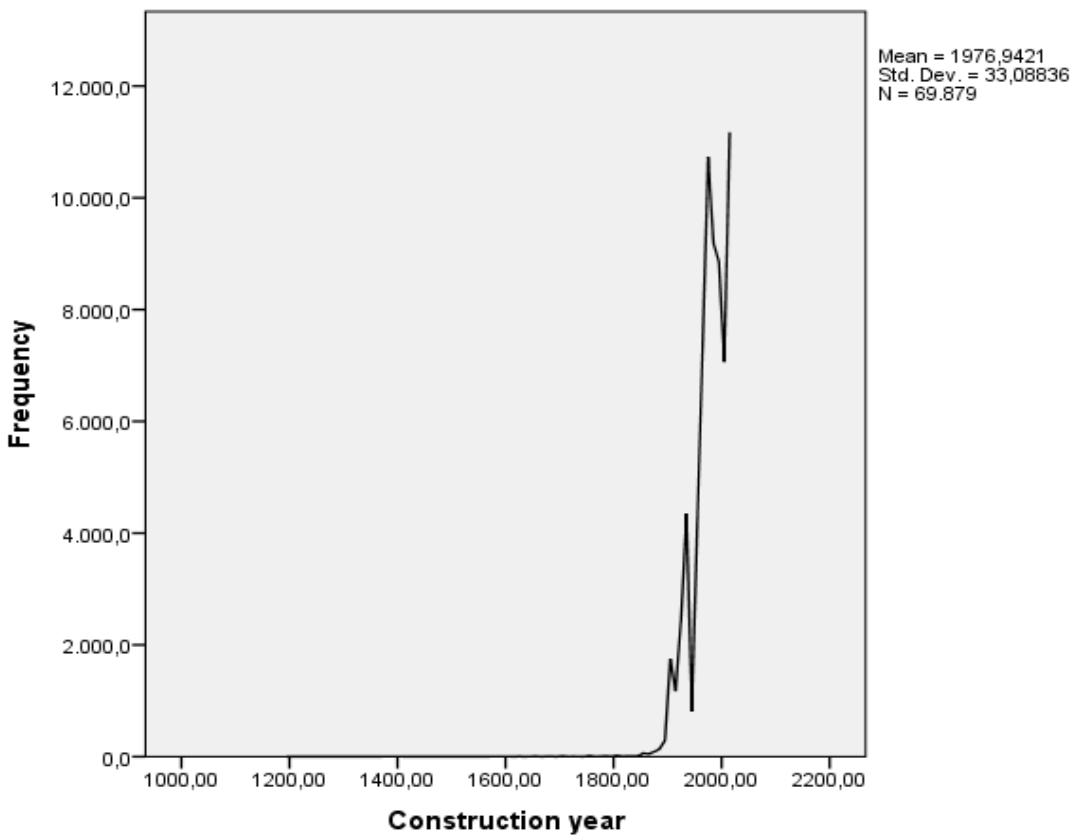


Figure 4 model 1. Distribution construction year. Source: NVM database transaction Q3/ Q4

Type of dwelling is also an important influencer for the value of a dwelling. In this research, 5 types of dwellings can be distinguished: Table 10 Frequency type of dwellings. Source: NVM database transaction Q3/ Q4" shows the distribution of these types. These dwelling has been chosen because these types are the best to compare with each other

Table 10 Frequency type of dwellings. Source: NVM database transaction Q3/ Q4

Type of dwelling (model 1)			Frequency	Percent
	Model 1			
Detached dwelling			10897	15,6
Semi-detached dwelling			14006	20,0
Linked detached dwelling			2223	3,2
End of terrace dwelling			11771	16,8
Terrace dwelling			30982	44,3
<b>Total</b>			<b>69879</b>	<b>100,0</b>

The size of the dwelling (floor surface) is one of the most important price determiners according to the literature. Figure 5 Model 1: Distribution of living surface m<sup>2</sup>. Source: NVM database transaction Q3/ Q4" shows the distribution of the dwelling size in this database. The average is 122,7m<sup>2</sup>. The total plot of the land has an average of 431m<sup>2</sup>. This plot average is very large. This can mainly be declared because of the dwellings in more rural areas and provinces like Friesland and Zeeland. It must therefore be considered whether this variable should be taken into account.

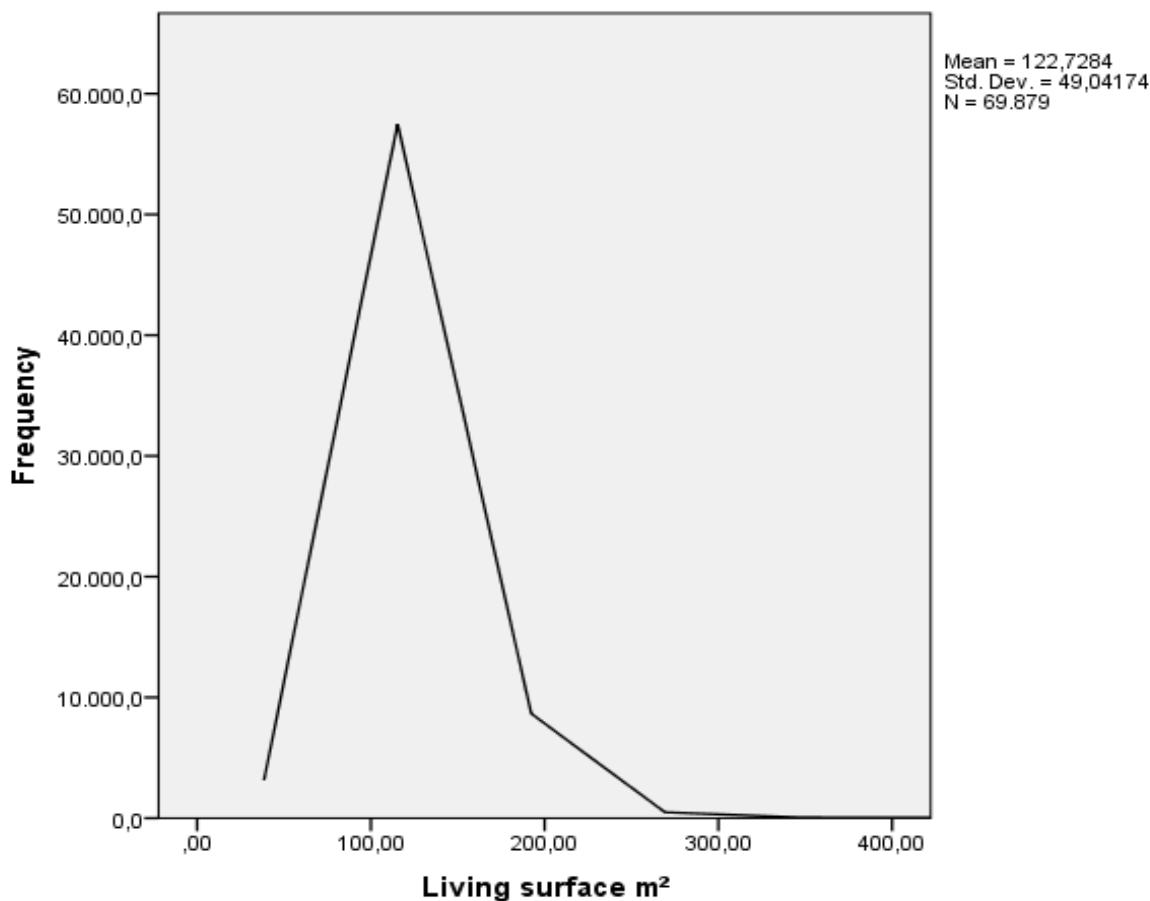


Figure 5 Model 1: Distribution of living surface m<sup>2</sup>. Source: NVM database transaction Q3/ Q4

In the used NVM database, conducted from real works, also the quality of a dwelling is visible. 25835 (35%) of the total database does not have a quality definition. 52% of the database has the quality label of 'normal', 9% of the total database has the "label" luxury and 4% has the 'label' simple.

The sustainability part in this database can be view within two variables, energy labels and energy index. In this database, energy label is the best way to measure sustainability because the amount of buildings with A label is much higher. Figure 6 Frequency energy labels. Source: NVM database transaction Q3/ Q4" shows the frequency of the labels. When label A is operationalized as sustainable, it can be compared with the other "non sustainable labels, B, C, D, E, F, G).

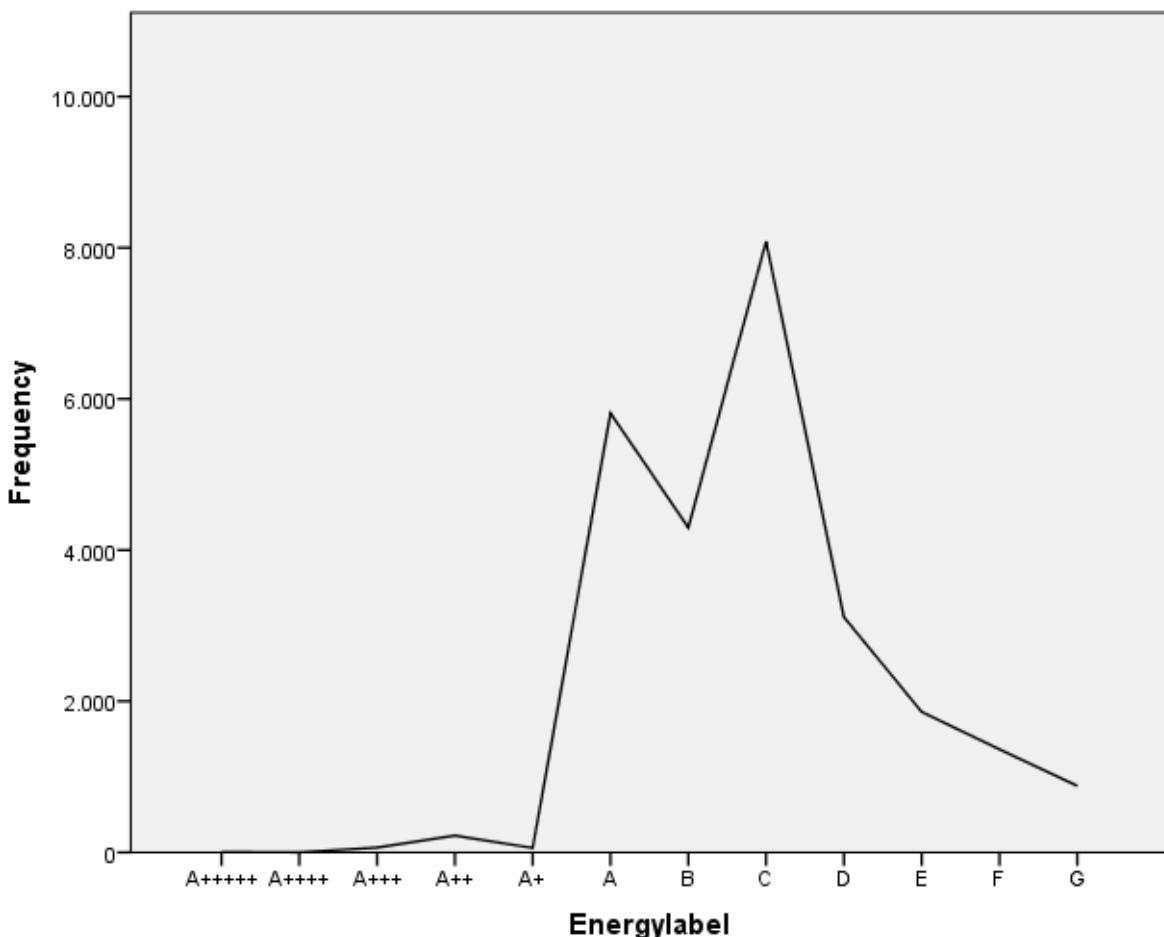


Figure 6 Frequency energy labels. Source: NVM database transaction Q3/Q4

For the energy index, even less buildings are provided within the NVM database. Only 1890 dwelling does have an energy index number. The energy index measures more extensively how energy efficient a dwelling is. The energy index is mostly used in rental properties. This can explain why this database contains few dwellings with an energy index.

### ***City characteristics***

- *Number of inhabitants;*
- *Population density;*
- *Coverage density;*
- *Degree of urbanity.*

A number of control variables is included at city level. This information is found in the CBS database. Because the NVM database is about dwellings who are sold in 2017, also the 2017 data from CBS is used. The CBS data is on zip code level, in this way, it was possible to merge the CBS data with the data from NVM. The data is on zip code level, this means that on neighborhood level the number of inhabitants can be viewed. This is also applies for the population density of a neighborhood and the degree of urbanity.

### ***Location characteristics***

- *Type of location;*
- *Address details;*
- *Amount of transactions;*
- *Address density.*

This is information about the type of location, think about the municipality and the province. The address details provided the zip code. This ensures that the CBS data can be linked per dwelling. The amount of transaction is a variable which ensures that we can see at which location or province the most amount dwellings are sold. The CBS data provides also the address density on zip code level. This address density is expressed in addresses per square kilometer and aims to reflect the degree of concentration of human activities (living, working, going to school, shopping, going out, etc.). The CBS uses these address environment density to determine the degree of urbanity of a certain area (CBS, 2018).

#### ***4.2.3.1 Statistical conditions***

In this hedonic analysis, a number of assumption must be met;

- The norm of cases is  $N=50+8m$ , m is the number of independent variables (Tabachnick & Fidell, 2007). In this research are more than 70.000 cases, this means that it is possible to test more than 1000 independent variables. This assumption has been met.
- A regression analysis must also comply with an interval / ratio measurement scale. This assumption is made. The independent variables are interval or ratio, or have been converted to dummies.
- Multicollinearity: There is a multicollinearity when two variables strongly correlate with each other. If there is multicollinearity, the same thing is measured by independent variables. This allows the regression model to lose purity to explain the dependent variable. This will be tested in the results part when the model is running. Correlations between variables are determined by means of a correlation matrix. If this matrix shows that there is a multicollinearity between independent variables, then the variables with the lowest regression coefficient will be disregarded.
- Autocorrelation is not allowed. The residues must be independent. Autocorrelation may arise for new dwellings. They are sold with a lot of the same dwellings in the same neighborhood or street and logically share the same residential environment characteristics. When dwellings in this study are not evenly distributed over a heterogeneous space and many dwelling transactions within a certain neighborhood are represented in the database, then a spatial autocorrelation may occur (Savin & White, 1977). With the Durbin Watson test, the autocorrelation is tested in the results.

The model in the hedonic price analysis must meet the above conditions. In the next chapter, it will further tested whether the model(s) meets the set of conditions.

### 4.3 Regression models:

First, the regression model 1 is conducted, this is the incomplete model with missing energy labels. Hereafter, the cases with the missing energy labels are removed and has been checked whether the model has changed. To determine which model is most suitable, the significance, the quality and the amount of autocorrelation are tested by running both models.

#### 4.3.1 Model 1

This first model is the total dataset with more than 69 thousand cases and few adjustments. dwellings without energy label are still here. The regression model with the transaction price as dependent variable is predicted by various independent variables.

##### 4.3.1.1 Significance and quality

The ANOVA (F-test) is used to compare the different variables based on means. The F-test indicates that the model as a whole is statistically significant if with 95% certainty or more can be said that there is a difference between the cases. The F value is calculated by the proportion of explained variance (Mean Square Regression) by the share of unexplained variance (Residual) (de Vocht, 2006) (Table 12 Model 1: ANOVA). When the sig. has a smaller value than 0.05, there is a significance difference between cases. In this model, the found F=2130.605. The amount of degrees of freedom is 16,42769. The column sig. gives the exceedance probability of the found F-value. In this model, p<0.001 (Table 11 Model 1: ANOVA). This means that this model is significant.

##### 4.3.1.2 Quality

The quality of the model is expressed with the R-Square (Buechler, 2007). The R-Square in this model is  $R^2=0.444$ . This mean that 44% of the variance of the dependent variable is explained by the independent variables. The adjusted R-Square in this model is  $R^2=0.443$ , this will say that in de population 44% of the variance of the dependent variable is explained by independent variables (Table 11 Model 1: Summary regression model).

Table 11 Model 1: Summary regression model

Model 1: Summary					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,666 <sup>a</sup>	,444	,443	81,153.2960427	,472

Dependent Variable: Transaction price of a dwelling

Table 12 Model 1: ANOVA

Model 1: ANOVA <sup>a</sup>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2245097524688 14,500	16	1403185952930 0,906	2130,605	,000 <sup>b</sup>
	Residual	2816705376469 26,800	42769	6585857458,60 1		
	Total	5061802901157 41,300	42785			

Dependent Variable: Transaction price of a dwelling

#### 4.3.1.3 Autocorrelation

In this test, the Durbin-Watson test is used to explain autocorrelation in this model. There must be no correlation between two consecutive values in the same data row. Values below 1 or above 3 can be harmful and are definitely multicollinear (Field, 2009). In this hedonic price analysis, the Durbin-Watson test is 0.472 (Table 11 Model 1: Summary regression model). Values approaching zero indicate positive autocorrelation. This means that there are autocorrelations in this dataset. The following section described model 2 in which the missing energy labels have been removed. After this , it can be checked which model is the best for this quantitative research.

### 4.3.2 Model 2

The second model concerns the adjusted dataset. The dwellings without an energy label have been removed. As a result, the data has become much smaller (25758 cases), but still representative, with the same distribution of dwellings through the Netherlands (Table 8 Frequency data distribution model 2: only dwellings with label: Source: NVM database transaction Q3/ Q4). Also in this model, the transaction price is the dependent variable and predicted by various independent variables.

#### 4.3.2.1 Quality of the model

The ANOVA (F-test) is also in this model used to see if the model is significant. The F-test indicates that the model as a whole is statistically significant because the sig. is below 0.05 (Table 14 Model 2: ANOVA).

#### 4.3.2.2 Quality

The R-Square in this model is  $R^2=0.587$  this means that 59% of the variance of the dependent variable is explained by the independent variables, this is much better than model 1 (Table 13 Model 2: Summary). The adjusted R-Square in model 2 is also 0.587, this will say that in de population 59% of the variance of the dependent variable is explained by independent variables. This is higher than model 1 and also a high percentage for social science research (Peeters, 2010). But this can be declared because there are at lot of variables in these

models. But compared with model 1, the amount of variables is the same, the quality of model 2 is higher.

*Table 13 Model 2: Summary*

Model 2: Summary					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
2	,766 <sup>a</sup>	,587	,587	68,609.5251809	1,025

Dependent Variable: Transaction price of a dwelling

*Table 14 Model 2: ANOVA*

Model 2: ANOVA <sup>a</sup>						
Model		Sum of Squares	df	Mean Square	F	Sig.
2	Regression	9831846055861 8,750	15 14687 14702	6554564037241 ,250	1392,435	,000 <sup>b</sup>
	Residual	6913562962931 4,150		4707266945,55 1		
	Total	1674540901879 32,900				

Dependent Variable: Transaction price of a dwelling

#### 4.3.2.3 Autocorrelation

The Durbin-Watson test is also in this model used to explain if there is autocorrelation. Values below 1 or above 3 are auto correlated (Field, 2009). In this hedonic price analysis, the Durbin-Watson test is 1.025, Table 13 Model 2: Summary. This means that there is no autocorrelation in this model 2.

#### 4.3.2.4 Multicollinearity

Another test to see if this model is correct, is testing the multicollinearity. Multicollinearity can arise in a multiple regression analysis. This can arise when correlation between independent variables explain almost the same variance in the dependent variable. This can be checked by looking at the tolerance value and the VIF value. A tolerance value of less than 0.1 or a VIF value of higher than 10 shows that collinearity is a problem (Field, 2009) (O'Brien, 2007). This is not applicable in this model Table 18 Model 2: Regression analysis coefficients. However, it must be said that the values "environmental address density" and "degree of urbanity" are almost problematic. This can be explained logically because these values are a bit similar.

#### 4.3.2.5 Choice of model

It can be concluded that model 2 is the best model because there is no autocorrelation and the adjusted R Square is higher than model 1, so model 2 is more explained by the independent variables. There is also no problematic collinearity. Model 2 will be used in this

research. At first, a number of adjustments are made in the model these are first explained in the paragraph dummy's. Next, the correlations between the independent variables and the dependent variables are discussed. Hereafter, the independent coefficient will be discussed.

#### 4.3.2.6 Recoded and clustered variables

In both models (1 and 2), the same variables were used to make a good comparison between the models. A number of nominal variables had to be converted in order to be able to run the model. New variables are made for the quality of dwellings and type of dwellings. These variables are ranked, quality; luxury = 1, normal = 2 and simple = 3. Type of dwellings are also ranked, with detached dwelling as first, and terrace dwelling as fifth. Also the variables Province are recoded and clustered. Province is ranked in different areas based on selling prices (Visser & van Dam, 2006) Table 15 Clustered province .The following section looks at the correlations between the variables. It is important to properly analyze the variables here.

Table 15 Clustered province

Cluster	Province
1: Urban area (Randstad)	N-Holland, Z-holland, Utrecht
2: Intermediary	N-Brabant, Gelderland
3: Periphery	Limburg, Overijssel, Flevoland
4: Rural area	Groningen, Friesland, Zeeland, Drenthe

Also energy label is clustered and recoded. Energy label is an ordinal variable and recoded into a numerical variable. In addition, not every energy label contained the same amount of cases. The labels are therefore also clustered to make the best possible analysis, shown in Table 16 Cluster energy label.

Table 16 Cluster energy label

Cluster	Energy labels
1:	A+++++, A++, A+, A
2:	B
3:	C
4:	D, E, F, G

#### 4.3.2.7 Correlations

In this section, the correlations between the independent variables and dependent variables are determined. The total overview of these variables are stated in the correlation matrix and can be seen in appendix 1. The correlation between 2 variables is expressed in the correlation coefficient. This is the Pearson Correlation Coefficient, this Coefficient is explaining the strength of the relationship between these variables. The direction of the correlation only shows whether it is positive or negative. The correlation of +1,00 or - 1,00

are the most powerful, these values mean that there is a very strong correlation between 2 variables (Field, 2009). In the correlation matrix, the significance of the correlation can also be read. A good significance indicates that the correlation cannot be coincidence. The strongest correlations between the transaction price and the independent variables, and the energy label and independent variables will be explained.

*Table 17 Correlation between Dependent and independent*

Dependent variable	Independent variable	Correlation
<b>Transaction price</b>	Content of dwelling	0,591**
	Floor Surface of dwelling	0,611**
	Quality of dwelling	-0,251**
	Province (cluster)	-0,320**
	Energy label	-0,179**

In Table 17 Correlation between Dependent and independent" are the highest and most striking correlations displayed. Every displayed correlation can be stated to be significant (\*\*= significant at the 0.01 level 2-tailed). On the basis of these correlations, it can be first stated that the model is reliable because the results correspond with the literature. In the literature is described that the size of dwellings are having a high influence on the transaction prices. This can be seen very clearly in the high and positive correlations between the dependent variable transaction price and the independent variables; content of dwelling and floor surface of dwelling. It can be said, a bigger dwelling has a significant higher transaction price than a smaller dwelling. The correlation between quality of a dwelling and the transaction price is negative, this can be declared because of the use of dummies. The number 1 is luxury, number 2 is normal and number 3 is simple. So, the higher the number, the worse the quality. A negative correlation means in this case, a worse quality is a lower transaction price. The same conclusion can be drawn for the province. Also for province are dummies made on a scale from 1 to 4. 1 is Urban area (Randstad) and 4 is Rural area Table 15 Clustered province. Also here, negative correlation is found. This means, the more the province is an outer area, the lower the transaction price.

In addition, the energy label is important in this quantitative study. Sustainability is in this quantitative study operationalized as energy label. The correlation coefficient of the energy label in relation to transaction price is -0.179. This means a negative relationship with transaction price. This can be declared because, the higher the label, the lower the transaction price. So, an A label does have a higher mean transaction price. Other high correlation can be found within the variable environmental address density and degree of urbanity and population density. This can be cleared because, the more Degree of urbanity the more dwellings and addresses are on a location. In the next chapter, the results of the hedonic price analysis will be shown.

## 4.4 Results: Hedonic price analysis

This paragraph will focus on the following sub question;

*What are the current effects of sustainability on the value of dwellings?*

To answer this question, the theory, interviews, and especially the hedonic price analysis were used. This hedonic price analysis is a multiple regression analysis. This analysis has tried to categorize and predict the price of the dwellings by a number of variables. The sub-question in this paragraph tries to determine whether sustainability has an effect on the value of a dwelling. This makes sustainability the independent variable. Sustainability has been operationalized in this quantitative part as energy label. This is the best way to measure sustainability.

The dependent variable in this hedonic price analysis is the market value of a dwelling. This has been operationalized as the transaction price, this is the final price that was actually paid for the dwelling. But prices of dwellings are often correlate with the size of the dwelling, that is also reflected in the following chapters. Therefore, the transaction price per dwelling and per square meter are used in this study. This paragraph first starts with the total regression analysis with all the important variables. Hereafter, a smaller regression analysis is conducted to get more detailed information of the effect of the energy label compared with the other building characteristics. This smaller regression is followed by more detailed research into the effects of the energy label on the transaction price of dwellings.

### 4.4.1 Results regression model 2

Within model 2, the regression analysis has been performed. In this model are variables with different beta coefficients (Table 18 Model 2: Regression analysis coefficients). There is one independent variable that do not prove to be significant, the plot of the land. This can be explained by the fact that buildings in Friesland and Zeeland with a much larger plot surface are cheaper than for example dwellings in Amsterdam without a large plot surface.

According to this regression model 2, the Province cluster has the highest beta coefficient of -,361. The provinces are divided based on the amount of sales ( Table 15 Clustered province).This can also be seen at the beta coefficient of - 0,361. This means, when you will go from the province North Holland, to the province of Friesland or Zeeland, the transaction price will decrease. Next to the province, floor surface m<sup>2</sup> has the greatest influence on the transaction price of dwellings, with a beta coefficient of 0,357. This means, that when the floor surface m<sup>2</sup> is getting larger, the price of the dwellings will be higher.

Sustainability is central to this research. Sustainability is defined in the quantitative research as an energy label. This is therefore also an important variable in this model. Energy label has a beta coefficient of -,119. Here, per less sustainable label, the transaction price of a dwelling is getting lower with a certain percentage per label cluster (Table 16 Cluster energy label), this will further be declared in section 4.4.3.

From this model (Table 18 Model 2: Regression analysis coefficients) it can be further concluded that both, the location and the size of the dwellings exert much more influence on the transaction price than the other variables. This regression also shows that "sustainable" dwelling (with label A) have a higher transaction price than non-sustainable dwellings (lower than label A). However, it remains difficult to deduce what exactly the price differences per label are. Therefore, also a more detailed segment regression analysis is conducted, with only the variables related to the building characteristics. This is shown in the next section, and represent in Table 19 Segment regression analysis.

Table 18 Model 2: Regression analysis coefficients

Model 2		Coefficients						
		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
	(Constant)	609311,919	51648,502		11,797	,000		
	<i>Population density</i>	,661	,254	,019	2,604	,009	,392	2,549
	<i>Degree of Urbanity</i>	5741,182	876,341	,071	6,551	,000	,178	5,628
	<i>Environmental address density</i>	23,741	1,232	,227	19,275	,000	,152	6,581
	<i>Year of built</i>	-206,035	25,189	-,057	-8,180	,000	,442	2,261
	<i>Content of dwelling</i>	138,636	7,652	,171	18,117	,000	,238	4,209
	<i>Floor surface m<sup>2</sup></i>	1220,778	31,592	,357	38,642	,000	,248	4,031
	<i>Plot of land</i>	,062	,065	,004	,949	,343	,997	1,003
	<i>Days on the market</i>	-37,624	2,482	-,072	-15,158	,000	,943	1,061
	<i>Quarter</i>	6645,457	962,271	,032	6,906	,000	,998	1,002
	<i>Quality</i>	-24691,477	1273,906	-,094	-19,382	,000	,897	1,114
	<i>Amount of citizen</i>	,596	,195	,015	3,052	,002	,870	1,149
	<i>Type of Dwelling</i>	-19132,396	398,144	-,281	-48,054	,000	,620	1,614
	<i>Province</i>	-35564,547	491,978	-,361	-72,289	,000	,847	1,180
	<i>Energy label</i>	-11098,744	643,612	-,119	-17,244	,000	,444	2,252

Dependent Variable: Transaction price of a dwelling

#### 4.4.2 Segment regression analysis: building characteristics

The total regression analysis is explained in the previous section. Initial conclusions can already be drawn from this analysis. In order to get a better and more detailed vision of the influence of the energy label on the transaction price of a dwelling, a smaller regression is conducted with only the building characteristics.

This regression analysis shows again that the plot surface variable is not significant (Table 19 Segment regression analysis coefficients). This will be still the same reason as in the previous regression analysis. Dwellings in Amsterdam without any plot of land around their can be more expensive than dwellings in Friesland with a lot of land around the dwelling.

Subsequently, this analysis also shows again that floor surface m<sup>2</sup> has the largest influence on transaction price with a standardized coefficient of ,390. After this follows the content of the dwelling with a coefficient of, 182. We also see here that energy label emerges as the third most important coefficient. This is an important fact. The year of construction, quality of the house and type of dwelling follows after the energy label. It is remarkable to see that the type of home has less influence on the transaction price. This could be explained because the characteristics of the type of homes are of greater influence, like the size, and year of built.

Table 19 Segment regression analysis coefficients

Model	Coefficients <sup>a</sup>						Collinearity Statistics	
	Unstandardized Coefficients		Standardized Coefficients	t	Sig.			
	B	Std. Error	Beta		Tolerance	VIF		
(Constant)	1091825,160	59774,424		18,266	,000			
<i>Year of built</i>	-477,110	29,625	-,131	-16,105	,000	,470	2,129	
<i>Type of Dwelling</i>	-5843,722	437,288	-,086	-13,364	,000	,754	1,325	
<i>Floor surface m<sup>2</sup></i>	1335,564	38,125	,390	35,031	,000	,250	3,996	
<i>Plot of land</i>	,082	,079	,006	1,035	,301	,998	1,002	
<i>Content of dwelling</i>	147,679	9,244	,182	15,976	,000	,239	4,180	
<i>Quality</i>	-29477,446	1541,742	-,112	-19,120	,000	,900	1,111	
<i>Energy label</i>	-12586,574	776,643	-,135	-16,206	,000	,448	2,233	

Dependent Variable: Transaction price of a dwelling

#### 4.4.3 Effect of the energy label on the value of dwellings

The previous regression analyzes shows a clear effect of the energy label on the transaction price of dwellings. The energy label appears to belong to the three most important variables in the regression analysis of building characteristics. Table 20 (Model 2: Table mean variables per energy label), shows the mean transaction price per energy label, also the year of construction and floor space m<sup>2</sup> per label is displayed. This table clearly shows how the energy label is associated with the most important price-determining variables in the regression analysis. The highest mean transaction price can be seen for label A+, the second highest mean transaction price is for label A. Also does label A has the highest floor space on average. It is striking, that dwellings with label A++ has are on average the youngest dwellings. Dwellings with energy label G are on average the oldest. The next sections will explain how the energy label affects the transaction price of dwellings.

*Table 20 Model 2: Table mean variables per energy label*

Type of label	Transaction	Floor Space	Year of Built
	price	m <sup>2</sup>	Mean
A+++++	€286.700,0000	119,60	2012,60
A+++	€230.000,0000	115,00	2017,00
A++	€283.078,0159	130,89	2004,22
A+	€257.425,0946	129,45	2016,08
A	€321.405,8475	127,17	2007,56
B	€301.843,0028	133,23	2003,67
C	€273.728,6415	127,15	1988,88
D	€239.330,0358	118,71	1974,55
E	€240.338,9139	114,36	1957,30
F	€240.667,1054	106,03	1947,85
G	€249.027,2949	105,44	1935,38
	€244.471,3693	108,52	1928,13

##### 4.4.3.1 Frequency per energy label

To get a better idea of the differences between the energy labels, the labels were clustered. This is also done because the frequency of cases differs much per energy label. Table 21 Frequency, cluster of energy labels), shows the cluster and frequency of the labels.

*Table 21 Frequency, cluster of energy labels*

Cluster energy label	Frequency	Percent
A+++++, A++, A+, A	6163	23,9
B	4298	16,7
Valid C	8082	31,4
D	7215	28,0
Total	25758	100,0

#### 4.4.3.2 Explanation of the effect of the energy label on the transaction price

After the labels have been clustered and the frequency per label is more equal, the most important and influencing building characteristics are compared with the energy labels to get a more detailed explained of the effect of the energy labels on the value of dwellings (Table 22 Cluster energy labels .

Table 22 Cluster energy labels and building characteristics

Cluster Energy labels		Transaction price per dwelling	Construction year	Quality (1=luxury, 2=normal, 3=simple)	Floor Surface m <sup>2</sup>
		Mean	Mean	Mean	Mean
Energy Label Cluster	A++++, A++, A+, A	€300,214.5231	2004	1,73	133,00
	B	€273,728.6415	1988	1,88	127,15
	C	€239,330.0358	1974	1,94	118,71
	D, E, F, G	€242,568.8421	1947	2,05	109,82

#### Comparison of label cluster and buildings characteristics

An effect on the transaction price can be defined per label step. This means, from cluster 1 (labels A) to cluster 2 (labels B), the price of a dwelling decrease with 9%. From cluster 2 (label B) to cluster 3 (label C), the price of a dwelling decrease with 13%. But from cluster 3 (label C), to cluster 4 (label D etc.) the price of a dwelling increases with 1,4%. Besides an effect on the transaction price, there is also a clear difference between the energy labels and the year of construction of the houses. The labels D, E, F and G are obviously the oldest on average while dwellings with an A label are the youngest on average. This also explains the difference in quality. On average, the A label dwellings, according to the NVM database have the highest quality, while the last cluster group have the least quality. Floor space also differs. There is not a big difference between the first three clusters here. Only if the first and last cluster are compared, there is a big difference in the size of the dwelling.

#### Comparison of label cluster and other characteristics

Next to the buildings characteristics, also other variables are compared with each other. In Table 23 Energy label cluster and other characteristics), energy label is compared with the variables "Environmental address density", "Population density" and "Days on the market". First, the comparison between the energy label and environmental address density is made. Between the first clusters, again, no big differences occur. But when cluster 1 (label A) and cluster 4 (label D, E, F, G) are compared with each other, a big difference can be found. The environmental address density in cluster 4 is much bigger than the first cluster. This can be

declared because older dwellings are more settled in the city center of cities, while label A dwellings are modern, and often build in neighborhoods outside the center of cities. This can also be seen when the variable population density is compared with the energy label. The same effect can be seen here. The difference between cluster 1 and 4 is big. And also here, the explanation will be the fact that older dwellings are built more in the city centre and new dwellings with an A label are settled more outside the city in new neighborhoods. Another interesting effect occurs from the comparison with the variable "days on the market". The difference between cluster 1 and cluster 4 is 25 days. This means that a dwelling with energy label D, E, F, G compared to a label A or better, is on average 25 days longer on sale, this is almost a month longer. And even the difference between cluster 1 (labels A) and cluster 2 (label B) is already 10 days.

*Table 23 Energy label cluster and other characteristics*

Cluster Energy labels		Environmental address density	Population density	Days on the market
Energy Label Cluster		Mean	Mean	Mean
	A+++++, A++, A+, A	1278,82	4169,62	94,18
	B	1278,25	4114,54	104,37
	C	1358,29	4130,87	103,69
	D	1611,67	4487,66	119,13

The variable "year of construction" is very different per label cluster , but the floor surface per m<sup>2</sup> between the label clusters 1 and 4 is also very different. The transaction price "per m<sup>2</sup>" is therefore also compared per label. Here, the difference between cluster 1 (labels A) and cluster 2 (label B) is a decrease of 6% in the transaction price per m<sup>2</sup>. Cluster 2 (label B) and Cluster 3(label C) shows a decrease of 5% in price per m<sup>2</sup>. But the last cluster (D, E, F, G) shows an increase of 13,4% the transaction price compared with cluster 3 (label C). From cluster 1 (label A) to cluster 4 (D, E, F, G) gives an increase of 0,8%. This can be explained by different factors. Older dwellings are more popular when they are older than 40 years (Wilhelmsen, 2008). But also, these dwellings are more settled in the city center, that explains the smaller floor surface per dwelling and the bigger population density per label.

*Table 24Energy label cluster and transaction price per m<sup>2</sup>*

Cluster Energy Labels		Transaction price per m <sup>2</sup>	Construction year	Floor Surface m <sup>2</sup>
Energy Label Cluster		Mean	Mean	Mean
	A+++++, A++, A+, A	€2,293.3821	2004	133,00
	B	€2,152.9562	1988	127,15
	C	€2,038.4931	1974	118,71
	D, E, F, G	€2,311.7275	1947	109,82

#### 4.4.3.3 Regression analysis: energy label as dependent variable

Finally, this section explains which variables are having the highest influence on the energy label, the dependent and independent variable are reversed and a new regression analysis is conducted (Table 25 Regression analysis with Energy label as dependent variable). Energy label is the dependent variable, and it is already clearly that the year of build has the highest influence on the energy label with a coefficient of -,673, which is very high. Hereafter, the quality of a dwelling with a coefficient of ,109 and the transaction price with a coefficient of -,098 are the highest influencing variables on the energy label.

Table 25 Regression analysis with Energy label as dependent variable

Model 2	Coefficients						
	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	54,657	,411		132,978	,000		
<i>Year of built</i>	-,026	,000	-,673	-126,106	,000	,830	1,205
<i>Type of Dwelling</i>	-,023	,005	-,031	-4,937	,000	,607	1,648
<i>Floor surface m<sup>2</sup></i>	-,001	,000	-,027	-2,648	,008	,234	4,280
<i>Plot of land</i>	-1,802E-006	,000	-,012	-2,440	,015	,998	1,002
<i>Content of dwelling</i>	,000	,000	-,035	-3,525	,000	,235	4,248
<i>Quality</i>	,308	,014	,109	21,392	,000	,904	1,107
<i>Transaction price</i>	-1,054E-006	,000	-,098	-14,450	,000	,511	1,956
<i>Environmental address density</i>	3,482E-005	,000	,031	3,930	,000	,378	2,647
<i>Population density</i>	-1,635E-005	,000	-,044	-5,776	,000	,406	2,460
<i>Days on the market</i>	2,194E-005	,000	,004	,776	,438	,936	1,069

Dependent Variable: Energy Label Cluster

#### **4.4.4 Concluding**

It can be concluded that the dataset and the results of this hedonic price analysis are reliable. Logical and explainable effects occur when investigating the building characteristics as well as the location characteristics. With certainty, after this hedonic price analysis, it can be said that dwellings with a better and more sustainable energy label (label A) are worth more than dwellings with an energy label B or lower. An average transaction price decrease can be found of 9% when a label A dwelling is compared with a label B dwelling. And even a transaction price decrease of 13% occurs when comparing a energy label B dwelling with an energy label C dwelling. It is striking when comparing a label C dwelling with an energy label D (or lower) dwelling, a price increase occur of 1,4%. This last effect also occur when comparing the labels with the transaction price per m<sup>2</sup>. The labels D, E, F and G are together even more worth per m<sup>2</sup> than the label A and better. To understand this last effect, different variables have been compared and a regression analysis with the energy label as dependent variable is conducted. And from this regression analysis, age was the greatest predictive variable. The energy labels D or worse are on average older than 70 years. And these older dwellings are more popular because of the appearance of the older dwelling. These energy label D dwelling are also settled in more densely populated areas. This means, more settled in the center of a city, and this will a positive effect on the transaction price of dwellings. Another interesting fact is the effect of labels on the selling time of dwellings. The difference between cluster 1 with label A dwellings and cluster 2 with label D, E, F, G dwellings is 25 days. This is almost a month longer. And even the difference between cluster 1 (labels A) and cluster 2 (label B) is already 10 days.

Concluding, the effect of a sustainable energy label on dwellings is positive. Dwellings with an energy label A or better have a higher transaction price than dwellings with an energy label B or lower. But this value increase is not only dependent on the energy label, but the variables "year of construction" and "quality of the dwelling" are linked with the energy label and are also important. And in addition, the variables location and size of dwelling remain the most important price determiners of dwellings.

## **5 Qualitative research: Interviews**

The quantitative research part has shown that there is currently a positive effect of sustainable energy labels on the value of dwellings. But energy labels are also linked to the age and quality of the dwelling, so there is still uncertainty to be able to say that these positive effects are linked to sustainability. This qualitative part examines in more detail how sustainability may have an effect on the value of dwellings. And especially, how these interviewees expect how sustainability will affect the value of dwellings in the future. Sustainability is in this chapter operationalized as the future sustainability measures, BENG and Gasless. And, as a logical consequence of this, also the effect of sustainability on land prices is researched. Construction costs and market value of dwellings are the main parameters of land price when calculated with the residual method of land valuation. When these parameters are affected, a value change can occur. This paragraph starts with an introduction of the qualitative research. Next, the selection of stakeholders will be explained, followed by the data collection. Chapter 6 will discuss these results with the theoretical framework and the results found in the quantitative part.

### **5.1 Introduction**

In the conduction of the interviews, the topics / chapters from the theoretical framework are followed. This makes it possible to compare and test the literature with the interviews. The interviews in this study have a semi-structured character. As a result, the content of the questions for the interviews are only partly established and the conversation can be entered with a broader view. Also the order and the number of questions have not been determined. The advantage of a semi-structured interview is that the interviewee has sufficient space to convey the present knowledge of the subject (Baarda & de Goede, 2006).

#### **5.1.1 Interviewees**

To determine how many experts are needed to be interviewed, it is important to investigate whether the results should be generalized or not. The qualitative research is conducted to carry out an idea of the effect of sustainability on the value of dwellings in the future. No results have to be generalized because the interviews are exploring possible future effects of the sustainable measures on the value of dwellings and land prices. In addition, a very structured interview must be held to make the generalization of interviews possible. It is in this case important that there is a theoretical saturation. This saturation will arise at the moment that little or no new information is conducted after performing new interviews (Guest, Bunce, & Johnson, 2006). In this study, saturation occurs when the interview data is not leading to more information related to the research topic, or the interview data does not provide more information than the literature already did. This can be done by constructing a model with the most important topics and questions, and by looking at whether each topic or question is been answered (Brod, Tesler, & Christensen, 2009). This is done by coding the answers per subject and can be found in appendix 3. Based on the literature, it is decided to interview experts from different sectors. These sectors are divided into 4 categories, namely

policy, advice, market and the contractor. Within these 4 categories a total of 10 experts are interviewed in the field of value and sustainability, see Table 26 .

#### *5.1.1.1 Policy*

The measures that are taken in relation to sustainability and dwelling are drawn up by authorities and governments, these measurements are described in the theoretical framework. The municipalities here are the executive authorities, and are also the parties who have a major influence on the land price development. These governments draw up a policy with a certain reason and expectation.

#### *5.1.1.2 Consultancy*

Various articles from consultancy firms have emerged in the theoretical framework. Some consultancies have already conducted their own research and view about sustainability and the effect on the value of dwellings and land prices, like the STEC advice group described in paragraph 2.6. But also Alba concept is an advice group who is advising municipalities how to handle sustainability and land prices.

#### *5.1.1.3 Market*

The market is ultimately the party who determines the price of dwellings. The literature describes these market parties, the appraisers and real estate brokers. The transaction price determines the final market value and the real estate broker sells these dwellings to the market. Next to these parties, also the Waarderingskamer is interviewed. This party determines the WOZ value of dwellings on the basis of the market value. In addition, they carry out annual research into the development of dwelling prices, and they also may see a possible effect of sustainable housing.

#### *5.1.1.4 Contractor*

The building sector has other interests than for example municipalities. The contractor will directly feel the consequences of these sustainable measures. Possible consequences are described in paragraph 2.4. To get a wide view, a contractor is also interviewed.

*Table 26 Respondents*

Theme	Name	Company	Function	Date
Policy	Dhr. ir. E. Rienhart	Gem. Tilburg	Program Manager Urban Development	20-12-2017
Policy	Dhr. E. van der Werf	Gem. Tilburg	Program Manager Urban Development	20-12-2017
Policy/Project developer	Dhr. C. Rieke	Gem. Rijswijk	Program Director RijswijkBuiten	10-1-2018
Advice	Dhr. E. de Leve	Stec groep	Senior Consultant	2-1-2018
Advice	Dhr. T. Platenburg	Platform 31	Senior Project Leader	14-12-2017
Advice	Dhr. Ing. W. Louwers	Duvas advice	Project Manager	14-12-2017
Advice	Jim Teunizen	Alba Concepts	Director	12-2-2018
Market	Dhr. ir. R.M. Kathman	Waarderingskamer	Member of management team	8-12-2017

Contractor	Mw. F. van de Meeberg	Dura Vermeer	Senior Project Developer	19-2-2018
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## 5.1.2 Dataset

This section briefly explains how the data was found and how the large amount of data is processed in this study.

### 5.1.2.1 *Data collection*

A topic list has been created before the interviews have been carried out. This list first provides structure during the interviews. In addition, this topic list ensures that the right topics are discussed and cited. The list contains the themes, topics and possible questions. this topic list can be found in appendix 2.

### 5.1.2.2 *Coding*

The qualitative data that emerge after the conducted interviews is part of an inductive study. This data therefore is used to draw up a theory, or to establish a theory. It was therefore not clear in advance which results would be found, therefore, the found data is structured. This has been done in the form of coding this data appendix 3. In this way, it is easier to draw conclusions from the large amount of found data. The conducted data was first transcribed, so the interviews were recorded and then prepared word for word. Afterwards, the coding of the transcribed data was done. The transcribed data is read again and key words are linked to relevant answers. The main theme per question is determined. After this, axial coding is done. For example, answers from different respondents are written out per theme. In this way are related answers combined. These have been used to draw relationships and conclusions. The transcripts of the interviews are not included in the attachment because of confidentiality considerations. Transcriptions are available on request. The coded data can be found in appendix 3.

### 5.1.2.3 *Results*

In writing the results, all the results from the coding are reviewed and structured to paragraphs related to the most important topic / research questions. In these paragraphs are the most striking quotes been used for illustrating. The results of the of the interview analysis are discussed in the following paragraph.

## 5.2 Results of the qualitative research

In this part of the qualitative research, the most relevant results per topic are displayed. This chapter will focus on the following sub questions;

- *What are the current effects of sustainability on the value of dwellings?*
- *What is the future effect of sustainability on the value of dwellings?*
- What is the effect of sustainability on the land price, now and in the future?

To measure the current effect of sustainability on the value of dwellings, sustainability is still operationalized as energy label. For measuring the future effects, BENG measures and gasless dwelling are operationalized as sustainability. The effect of sustainability on land prices is split in the already known effect of sustainability on land prices, and what the expected effect of sustainability will be in the future. The most important, relevant and striking answers are shown in this results part. Chapter 6 will discuss these results with the literature. The coded interviews can be found in the appendix 3.

First, the current effect of sustainability on the value of dwellings is described. Hereafter the expected future effect of sustainability is explained. And this results part end by explaining the effects on land price, now and in the future. This chapter is followed by the discussion of the results in relation with the theoretical framework.

### 5.2.1 The current effect of sustainability

The information found in the theoretical framework and hedonic price analysis is also presented to the interviewees. They were asked what effect of sustainability on the value of dwellings currently can be seen. The following sub question is tried to answer:

*What are the current effects of sustainability on the value of new dwellings?*

The interviewees were asked how they interpret the results, emerged from the theory in this research. For example, their opinion is asked about the results contradictions in the theory about value effects of sustainability. One interviewee indicates that the results of Brounen (2011) show an increase in value, but that this increase is just as large as accuracy of a valuation. An interviewee indicates that the effects from the research of Brounen are less than the accuracy of valuations:

*"At the moment that the market analysis is sufficient in the field of sustainability, you can and should take it into appraisals. But up to now, expectations are not high, and the effects of sustainability are less than the accuracy of valuation. Market forces cannot be invented. This can only be seen via market analysis and we do not see effect in our market analysis at this moment" (policy, 2017).*

This also corresponds to the statistical results in this research. Table 27 Result current effect of sustainability shows results from the interviewees regarding this subject.

Table 27 Result current effect of sustainability

Current effect of sustainability		Respondent
Positive effect	Price increase, but whole quality improved, not only sustainability.	Policy
	Up-to-date is sold very well.	Market
	After marketing, sustainable dwellings sold better.	Policy
	Dated dwellings are less easy to sell.	Advisor
	Effect of A label positive. But can also because the age and the up to date dwelling.	Policy
No effect	Buyers of dwellings do not ask how sustainable dwellings are.	Market
	Location and quality is more important.	Market
	After a lot of research, no effect occur.	Policy
	Location and attractiveness are more important.	Market
	Extra investment of €18.000,- does not lead to a higher value of €18.000,0	Municipality

Both consulting firms, consultants and policy makers all indicate that dwellings that are completely up-to-date are currently being sold more quickly and properly. The reverse is also visible for dated dwellings. These are sold under the valued market value and are more difficult to sell. In addition, a broker also indicates that the sale of a dwelling is really about the location, but also about the more luxurious facilities of the dwelling. The only stakeholder who indicates that dwellings have started to sell better because of sustainability is a municipality. Through marketing, but also through stimulation in the form of a discount on land prices, they have been able to build a sustainable neighborhood and sell them for the same price as non-sustainable dwellings. In the beginning the discount was really necessary.

#### 5.2.1.1 Ending

In the answers of the interviewees, both, the literature and the quantitative research parts are confirmed. At this moment, there is some guarantee that sustainability will have an added value for dwelling or make them sell better, but there is doubt if it is because of sustainability or other factors. However, there is a municipality who explains that they see a better sales in sustainable dwellings. These effects became visible after stimulating the sales by discounting the land price. This is interesting for the next section in this chapter, that deals with future effects of sustainability.

## 5.2.2 Effect of sustainability in the future

In this paragraph, the economic impact of the future sustainable measures on new dwellings. The effect of the obligations to build sustainable will be discussed. This is based on the results of the interviews, insights will be given into the possible effects of BENG and gasless constructions that may effect on the value of new dwellings. With these results, the following sub-question can be answered:

*What are the future effects of sustainability on the value of new dwellings?*

In the previous quantitative chapter, it has already been described that there is currently a positive effect of sustainability on the value of dwellings, but there is also uncertainty because several factors are important in determining the value of a dwelling. The quantitative component has also provided insights and also shows the uncertainty. On the basis of the interviews results, insights are given into how different stakeholders think about the effects of the future measures regarding to sustainability and the effects on the value of dwellings in the future. First of all, the expected additional costs will be discussed. After the interviewees are asked how to deal with sustainability and valuations of dwellings. The market will also be discussed, and the paragraph will be concluded with insights into innovations and expected effects on the value.

### 5.2.2.1 Building costs

As described in the literature, measures have to be taken to comply with the new laws and regulations for dwellings in the future. According to the theoretical framework, the expectation is that the building costs of a dwelling will rise between €6.000 till €30.000,- to comply with BENG. Just like the literature, conflicting expectations arise from the interviews with regard to the extra costs to comply with BENG. Here is a selection of the responses and the contradictions in Table 28 Results costs of BENG and Gasless)

Table 28 Results costs of BENG and Gasless

Costs of BENG and Gasless dwellings		Respondent
Extra costs	Extra costs BENG: €30.000,-	Advisor
	Definitely extra costs for BENG	Advisor
	Current mark and huge demand, costs will not become less	Advisor
	Costs will not become less because of rising material costs	Advisor
	€25.000,- extra costs for BENG	Contractor
	Extra investment for BENG €25.000,-	Advisor
No extra costs	Possible to build zero on the meter without extra costs	Advisor
	First extra costs, because of innovation and mass production not much extra costs.	Municipality
	Split the costs, 1/3 for customer, 1/3 for municipality and 1/3 for the contractor	Advisor

A respondent indicates that the construction costs will not become less in the coming period. This has to do with the current market and the huge demand for dwellings. And next to this, innovation will lead to lower construction costs in the future. It is striking that municipalities explain that costs will not be that high while other respondents all indicate that the extra costs will be around €30.000,-. In conclusion to the reactions about the costs, there is an adviser who indicates that additional costs will arise. A solution must occur here. He indicated that the costs should be divided among the three main parties involved in these costs. After these interviews, we can still say that the extra costs will be around €30.000,-

#### 5.2.2.2 Future innovation

Innovation and large-scale sustainability will play an important role in reducing costs. The large scale ensures innovation, and the innovation ensures a cheaper and more sustainable solution, according to various respondents. Respondents also indicate that in addition to innovations by builders, more things will change: "*You will see links coming between companies that we did not know it was possible. As a result, more and more links between companies and new companies will arise. And you also see that in heat and electricity. Organizations will arise that we do not know yet. But you can count on that to happen, and that they will come in the next 10 years. Innovation will therefore play a role in the costs of making the housing market more sustainable. But what will this do with the value and valuation of the dwellings?* " (policy, 2017)

#### 5.2.2.3 Valuating

In addition to the fact that explaining the costs for BENG and gasless are difficult, there is also difficulty in determining the added value of sustainability:

*"It is always difficult, because those dwellings will never be exactly at the same location of non-BENG dwellings. Because they were built earlier and in other locations. So if they actually have quality, that is difficult to compare. I also expect that a part can be found in a higher free-to-name price. Because if you are going to look more pure or better. Then you have to look at what the follow-up prices are. What is this property worth if a seller will resell this property to another buyer."* (advisor, 2017)

This means that in order to be able to compare and appraise real estate, these properties must be in exactly the same location, and have exactly the same characteristics, only then can you say what the value of sustainable measures is. This is also confirmed by the following municipality; "*In the beginning, then you cannot value it. And at some point you have built up enough data. So you can appreciate it.*" (constructor, 2018).

This could therefore mean, that in the future, when all dwellings would be built under BENG conditions, it will be more clear to give a value to sustainable dwellings.

#### 5.2.2.4 Expected future effect on the value

In the literature, ambiguity arises when it comes to sustainability and the current effects on the value of dwellings. These contradictions have also been submitted to the respondents. The following question was about how they expect the future effect on the value of new dwellings, the most striking answers are stated in Table 29 Results future effect on the value of dwellings).

Table 29 Results future effect on the value of dwellings

Future effect on the value of dwellings		Respondent
Positive effect	Not a sustainable dwelling means a lower value and higher energy costs	Advisor
	Scale volume of BENG will create later a higher value	Policy
	Expectation is that BENG dwellings will be worth more	Advisor
	Scale volume will create ambassadors who will promote and create value	Contractor
No effect	Not much empirical evidence at this moment	Policy
	At this moment, not much effect, maybe later when more dwellings are sustainable	Advisor

This is opposed to up-to-date dwellings that are increasingly easier to sell. This already gives an idea of how the market is developing. In addition, it is much more important to see how the market will develop when many dwellings have been added who are energetically efficient. The market cannot be predicted in advance, but is expected that there will be a shift in the market. Also from these answers it is not clear what the change of value will be, but the expectation is that in the future, the BENG dwellings have a higher value, and less sustainable dwellings will have a decrease in value, also because the rising energy costs.

#### 5.2.2.5 Role of the market

It has been described in the literature that the willingness to pay for sustainability in the market is increasing, but this is happening slowly. Table 30 Results market and sustainability) shows answers regarding to the market.

Table 30 Results market and sustainability

Market and sustainability		Respondent
It is not possible to predict the market forces		Policy
Differences in value because of sustainability, than it can be put in a valuation model		Policy
At this moment, not much interest in sustainability from individuals		Advisor
Starters cannot afford sustainable dwellings, they will make old dwellings sustainable		Advisor

Location and the attractiveness of the property are still much more important. So the question is how the market will develop in the future, but is difficult to predict the market. An important factor in the market is affordability. At this moment, the prices of dwellings are rising very fast, if the additional foundation costs of sustainable construction also come up, then the question rises about what the customer can pay. An effect that can arise, is that older dwellings will sell better in the future. Another incentive for the market is clarification in the payback period. When there is a clear payback time and is shorter, people are increasingly inclined to pay for sustainability. Now it is still uncertain.

#### 5.2.2.6 *Ending*

From these interview answers, it can be stated that the future effects of sustainability are not clear, but it is expected that there will be a positive effect on the value. However, some expectations have arisen and it become clear that the scale and marketing of sustainable construction may have a major influence on being able to value and even increase the value of sustainable dwellings. There is also the expectation that non-sustainable dwelling will lose value. But these dwellings also will increasingly higher energy bills. It could also help if more clarity arises around the payback period for sustainable measures

### 5.2.3 Effect on the residual land value

In this section, the residual land value is central. Because in this research and also in the literature, the land value is often determined with the residual land valuation method, the preceding paragraphs are important because they explain the parameters of the land value. These parameters are the market value of new dwellings and the construction costs of new dwellings. With the interviews, the following question is tried to answer.

*What is the effect of sustainability on the land price, now and in the future?*

The first striking point in the answers of the respondents is a range from a lower land value, to an increase in land value. The respondents were asked how they expect the effect of sustainability on the value of land prices. And they were also asked if these effects on the land value will change when the sustainable measures are mandatory.

#### 5.2.3.1 *Effect on land value before 2020*

There are less obligation for dwellings built before 2020 in terms of sustainable construction. This means that currently, municipalities themselves must be able to encourage builders and developers to build sustainably. Looking at the core of this story, do the additional costs to build sustainable have to be included in the foundation costs? When counting residual, higher foundation costs could lead to a lower land price when the market value will not increase. Municipalities could lower their land prices. This lower land price could then be used as an incentive to allow the developer to build sustainably. This question has been submitted to respondents. Table 31 Results effect of sustainability on the land value) shows the results of the respondent regarding this subject.

Table 31 Results effect of sustainability on the land value

Valuation of dwellings and sustainability		Respondent
Effect on land value before 2020	Residually lower land price, to achieve ambitions	Policy
	Reduced prices, not because sustainability, but for promotion	Policy
	Negative effect occur because extra costs of sustainability is not seen in the value	Policy
Effect on land value after 2020	Policy does not lead to optimization, so reward people	Policy
	Innovation means cheaper construction than an increase of value can lead to a plus on land value	Advisor
	The value of land will not fall due to rising construction costs	Advisor
	Costs will be higher and dwellings need to be affordable. So the land value will decrease	Market
	When dwellings are not affordable, banks must be considered like triodos bank and not a lower land value.	Policy
	Municipalities must function from a private law task and act in line with the market	Advisor
	Municipalities are not allowed to give state support	Advisor
	People will pay more for sustainable, so a normal land exploitation is possible	Contractor
	In the beginning, BENG leads to a lower land value	Contractor

### 5.2.3.2 Effect on land price after 2020

After 2021, it is no longer necessary stimulate constructors to built very sustainable dwellings. This is because BENG is mandatory from 2021. So, no stimulation is needed anymore. Yet, also here stakeholder react differently. Table 31 Results effect of sustainability on the land value) shows the reactions of respondents. Striking is the fact that a municipality react different then the other respondent. They indicate that the land value will not become lower, and no policies will be made to lower land prices. While a real estate broker indicates that the land value needs to be lower because of the higher construction costs. The answers are concluded by a innovative constructor. They explain that in the end, people will pay more for sustainable dwellings. This means that the higher construction will be compensated with higher value, and so the land value does not change. But also they indicate, that in the beginning of BENG, it will lead to lower land values when calculating the value residual.

### *5.2.3.3 Extra advice from respondents*

In addition to these expected effects, interesting advice from respondents has also emerged. Aspects that are barely mentioned in the literature state in Table 32 Extra advice.

Table 32 Extra advice

Extra advice	Respondent
Other way of dealing with land prices. Take more sustainable aspects into account like saving energy, better materials.	Advisor
Higher construction costs can be compensated with sustainable aspects as added value.	Advisor
Cooperation between urban planner and the planning economist have to be better. This can lead to a higher land value	Contractor

A step that goes beyond adding extra values to the residual calculation comes from an innovative contractor. This indicates that not only the addition of the sustainable aspects to the residual calculation is important, but that much more can be done to earn more on the ground, while there are higher costs for sustainable dwellings. These extra advices give new insights to advice Gloudemans.

### *5.2.3.4 Ending*

From these answers related to land price, it can be stated that at this moment, municipalities encourage constructors to build sustainable by lowering the land prices. But this stimulation will probably not happen in the future. There is also a lack of clarity among the stakeholders about this topic. It is interesting to see that municipalities react differently and more cautious in lowering the land prices. Assuming a scenario, in which the value of dwelling will not significantly rise, but those construction costs will rise. This scenario will create a negative effect on the land price. In that case, land prices must be dealt with in a different way. And also, extra cost for sustainable measures will have to be charged in a different way.

## **5.2.4 Concluding**

Saturation occurs in the results from the quantitative research part. Enough information is found about the research topics. Contradicting answers appear from the different stakeholders. Yet, this seems not be strange, because in the literature there is also a lot of uncertainty about the topic of sustainability and the effects on the value. The next chapter discusses the results from both, the quantitative and the qualitative part with the theoretical framework.

## **6 Discussion**

The previous chapters displayed the results from the mixed methods. This section will interpret the implication of the results. The results are explained by linking them to the results found in the theoretical framework. Limitations of the research and alternative explanations of the results are given. The discussion ends with a comment on the importance of the findings.

### **6.1 Effect of sustainability on the value of dwellings**

#### **6.1.1 Current effect on dwelling**

The statistical analysis clearly shows that there is a positive effect of the more sustainable energy labels on the value of dwelling compared with other dwellings with a less sustainable energy label. The analysis shows that per label step to a less sustainable label, there is a decrease in the transaction price (Table 19 Model 2: Table mean variables per energy label). A label step from label A to B means a decrease of 9% of the average transaction price. And even a decrease of 13% of the average transaction price occurs when a step is made from label B to C. It is striking when comparing a label C dwelling with an energy label D (or lower) dwelling, a price increase occur of 1,4%. These result is are in line with the literature from previous studies. Brounen (2011) already shows this change in value in his research. But Brounen (2011) indicates a smaller effect of energy label C to B, while in this research, the step from C to B has the greatest value effect. Other effects like the big difference between label A and D, E, F, G are also in line with previous conducted studies from Brounen (2011) and the University of Tilburg.

Another interesting point is also researched by the University of Tilburg, the time of selling a dwelling. They mentioned an very big effect, namely the sale of a less sustainable dwelling is much slower, namely 66 days more than a dwelling with a sustainable label (Tilburg University, 2017). In this research, also the effect on the sale time is researched. In this research, the difference between cluster 1 with label A dwellings and cluster 4 with label D, E, F, G dwellings is 25 is days. So the sale time of a dwelling with a less sustainable label is on average almost a month longer than dwellings with a sustainable label. So it can definitely be said that dwellings with a less sustainable label are more difficult to sell, but the effect in this research is less than in the literature. This research of Brounen was carried out 6 years ago, this makes it special that the result are still comparable, and therefore the market here has not or hardly changed. This is in conflict with the literature, which indicates that every year the willingness to pay for sustainability increases (Nielsen, 2015).

And in addition, other price indicating factors must also be considered. The energy label has only a small value determining factor compared to the floor surface variables and the location. The statistical analysis also shows that all dwellings with label A or better are on average younger than the energy labels below A (Table 19 Model 2: Table mean variables per energy label). Also in terms of quality of the dwelling can be seen that label A and better, on average have a better quality. When comparing this difficulty with previous conducted

studies, these doubt are confirmed. In 2016, the research agency Calcasa researched the value effects of energy labels. Yet they indicate that the value effect is as good as negligible (Calcasa, 2016). Research by Norwegian professor Jon Olaf Olaussen from 2017 even invalidates the results of the 2011 Brounen study. He indicates, that after researching the energy labels in Norway, first an increase in value was found in the results, but after a more detailed analysis, there was no value increase (Olaussen, 2017). However, he indicates that the real energy efficiency of a home can provide a value change, just like the aspects such as location and property surface. These results are also in line with the results from the hedonic analysis in this thesis. The results of these studies were also presented to the interviewees (paragraph 5.2.1). A part of the interviewees indicates that no direct value improvement can currently be seen due to sustainable improvements. Only a municipality and contractor explain that when building a big volume of sustainable dwellings, a positive effect can be found comparing to other less sustainable dwellings. Their answers are in line with the results from the hedonic price analysis.

### **6.1.2 Future effect on dwelling**

The current effects of sustainability have been researched, and can help to outline a future vision. In addition, an attempt was made to use interviews to outline a vision of various parties about the effects of BENG and gas-free on new dwellings. First of all, the additional construction costs were examined, similarity can be found with the literature. It is expected that the extra costs will be between €8,000,- and €30,000,- (Nieman, DGMR Bouw B.V., 2017). The interviewees also indicates these amount of additional costs (paragraph 5.2.2). Nevertheless, the past has to be taken into consideration, like the results from the construction costs index and the EPC improvements. These results shows an increase in construction costs after improving the EPC norms, but also a decrease in the period that followed (Vonk, de Wilde, & de Groot, 2017). So there can be a temporary increase in these costs, but followed by a decrease through innovation and mass production. Also the interviewees indicates a possible decrease in construction costs because of mass production and innovation, but at this moment, the construction costs are still rising.

According to the interviewees, the value effects will not correspond with these costs increases. Most interviewees indicated that it is expected that the BENG dwellings in principle will have higher added value than "not" BENG dwellings, but not a big difference. This is also in line with the results from the quantitative analysis. However, it is expected that, with a view to the future, dwellings that do not comply with BENG, or with a gas connection, will have a decrease in value. The value of dwellings is ultimately determined by the market. And as interviewees indicate, the market cannot be predicted (paragraph 5.2.2). There will also be a larger role for appraisers. At this moment, sustainability is barely taken into account in valuations, this has to do, among other things, because the market is not yet responding strongly to sustainability. The ultimate expectation of the effects on the value of dwellings can be found in a decline in the value of non-sustainable dwellings. Here are, of course, exceptions such as dwellings in very popular locations, like Amsterdam.

## **6.2 Effect of sustainability on the land value**

### **6.2.1 Current effect on land**

From the interviews it appears that the municipalities currently apply discounts to the land price. (paragraph 5.2.3). It appears from the interviews that they are currently doing this to stimulate sustainable ambitions. It also appears that municipalities lower their land prices to improve the promotions of certain dwellings. That does not even have to do with sustainability. A municipality also indicates that when calculating with the residual land valuation method, a surplus value of sustainability cannot be seen in the value of the dwelling (paragraph 5.2.3). This creates a negative land value. Liem, (2016) researched the effects of durable labels on the land value, his results show that the residual land value of offices is on average 7 to 9% lower than that of less sustainable offices (Liem, 2016). This corresponds with the results of the interviews. Land prices are therefore not only lower because municipalities use discounts for stimulation, but also because the land prices will be lower because of the higher construction costs for sustainable dwellings. And higher construction costs affects the land when calculate the land price with the residual method of valuation for land.

### **6.2.2 Future effect on land**

After 2020, there is no need for extra stimulation to make the built environment more sustainable because new dwellings have to meet with the BENG regulations. Nevertheless, effects can be found on the land value because of the introduction of BENG. From the interviews and literature, it appears that the costs for realizing BENG dwellings are higher than non BENG dwellings. These higher construction costs have to be compensated according to the interviewees, otherwise higher prices will arise for these dwellings (sub paragraph 5.2.3.2). Or, when the land value is calculated with the residual method of valuation for land, the higher construction costs will be reflected into lower land prices (sub paragraph 5.2.3.2). A municipality also indicate that the land prices should not be reduced, but that the extra foundation costs must be financed by sustainable banks such as the Triodosbank (sub paragraph 5.2.3.2). When comparing these results with the literature, it can be seen that the research by Liem, (2016) already indicated that sustainable buildings can cause a negative impact on the value of land. This is also in line with the answers from the interviewees.

Nevertheless, an older study by Kort, et al (2014) already indicates that land prices should be determined in a different way. Energy savings and comfort must be taken into account as an added value in the residual method of valuation for land. This means that, despite the extra investment costs, a capital gain can be realized on the land price. This way of approaching the land price has also emerged from the interviews. An interviewee indicates that more aspects need to be considered in the residual land valuation method. For example, he indicates that sustainable aspects such as a longer life span of materials and a lower bill should be taken into the residual land valuation method. As a result, the higher construction

cost of BENG can be compensated (sub paragraph 5.2.3.3). This totally corresponds to the article of Kort, et al (2014).

### **6.3 Limitations**

This study faces a number of limitations. First, the statistical part of this study is limited by a number of variables, while there are much more influencing variables in determining the value of a dwelling. These are values like distance to work, income of residents. But also more detailed information of the sustainability of a dwelling such as isolation or other special installations. But because the results corresponds with other researches and the answers from the interviewees, it does not seem to be a big limitation. Second, the statistical part only researched the last two quarters of 2017, the reason of this was to give the most recent results. The third limitation of the statistical part, is that only dwellings are researched, and no apartments. This can be a factor for further research. Fourth, the interview results are used to reflect the theoretical framework and statistical analysis. And with these semi structured interviews, there may be interviewer bias. Interview results are also not objective. But because there is chosen to interview different parties and sectors, there is given a more complete overview. Fifth, this research mostly looked at the economical value of dwellings. But the results show more important "value" factors. Energy costs, durable materials and comfort must be taken into account. This means that the way of valuing a dwelling must also be done differently. There are already studies about this subject, but in the world of appraisers and real estate brokers, these way of taking the "added" values of sustainability into account is almost not done yet.

### **6.4 Importance**

The quantitative analysis shows that there is certainly a value increase of dwelling due to sustainability. But the hard part of these results is that there is still a lack of clarity, and there is no clear answer as to whether or not there will be an increase in value due to sustainability in the future.

However, the doubts that have arisen in the literature are confirmed in this study. And the studies that do not show a clear appreciation of value through sustainability are confirmed in this thesis. This has been confirmed by the statistical analysis and by the interview results. The ambiguity has thus been confirmed. And with these confirmation, it must be ensured that more clarity is created in to the added value of sustainability.

This means that values must be linked to the sustainable aspects by appraisers, among other things. This can cause people to see that a home is more "worth" due to sustainable aspects. The energy saving and costs savings must be more visible. Lease constructions and financing from sustainable banking will help to reduce the extra costs for sustainability. This can have an positive effect in the future. Yet, the market is ultimately the one that determines what happens to the value of dwellings. And the market cannot be predicted.

## 7 Conclusion and recommendation

In this research, the central question was: "*What is the effect of sustainability on the value of new dwellings and land?*". This chapter will answer this central question by explaining the sub-questions. To research the effects of sustainability on the value of new dwellings and land, first the definition sustainability has to be operationalized. Therefore, the first sub-question is:

### *1. How is sustainability determined and operationalized?*

For the current effects, sustainability is operationalized as an energy label. Label A and better are "sustainable" dwellings and the labels below A are seen as non-sustainable dwellings. To examine the effects of sustainable measures in the future, sustainability is operationalized as BENG and gasless. Sub-question two explain these measures:

### *2. What are the future laws and regulation for dwellings regarding to sustainability?*

The most important measure is BENG. BENG stands for Almost Energy Neutral Dwellings and consists of three important indicators. These indicators are about a maximum energy requirement for a dwelling, a maximum primary fossil energy use and a minimal share of the use of renewable energy. In addition, the government has expressed the ambition that all the dwellings in the Netherlands have to be removed from the gas grid in 2050 and therefore is this measure also added in this research. It is important what the effect of these law and regulation are on the value of dwellings. To answer this question, first it is important to explain how the value of dwellings is determined:

### *3. How is the value of dwellings determined and what are the influencing parameters?*

In this research, value is operationalized as the market value and the transaction price of dwellings. Value of dwellings is often determined with the comparative approach. This approach compares transactions of dwellings in the same region and with same end user purpose. The hedonic price analysis in this research also compares dwellings and their characteristics. These characteristics are the influencing parameters. These are distinguished as building characteristics, location characteristics and city characteristics. The value effect of these parameters and sustainability is explained in the fourth sub-question:

### *4. What economic effects of sustainability on dwellings are already known?*

The most important effect is an average transaction price decrease of 9% when a label A dwelling is compared with a label B dwelling. And even a transaction price decrease of 13% occurs when comparing a energy label B dwelling with an energy label C dwelling. It is striking when comparing a label C dwelling with an energy label D (or lower) dwelling, a price increase occur of 1,4%. This can be explained because older dwellings (more than 40 years) are more attractive. These value effects are also comparable with the literature, like the research of Brounen et all 2011. Another important finding is the difference in sales time between dwellings with a label A and dwellings with label D or lower (E, F, G) that is 25 days

on average. The university of Tilburg also notice a longer sales time of less sustainable dwellings, but even a longer time of up to 66 days (Tilburg University, 2017). Next to these results, it has to take into account that there are parameters with bigger effect on the value of dwellings, these are location and size of the dwelling. With these results, the fifth sub-question can further be answered:

*5. What are the future effects of sustainability on the value of new dwellings?*

The interviewees indicates an amount of additional costs of around €25.000,- for the BENG measures. And next these additional costs for BENG, also additional costs for dwellings without a gas connection are important and will be around €15.000,- (Cobouw, 2017). But in the construction costs index from Vonk et al 2017, higher construction costs in the past occur after sharpening the sustainability measures, but after a certain period, the costs will decrease by means of innovation and mass production, this is also indicated by the interview respondents. However, it is expected that, with a view to the future, dwellings that do not comply with BENG, or with a gas connection, will have a decrease in value. The effect on the costs and the value of dwellings is also affecting the land value, therefore, the sixth sub-question is:

*6. How is the value of the land currently determined and what are the parameters?*

The value of land is often determined by independent parties such as Gloudemans. This is to prevent that municipalities just determine a value for the land (Nozeman, 2010). This price determination is often done by the residual land value method. Parameters in this method are; construction costs of dwellings, profit of dwellings and the market value of dwellings. When the construction costs are subtracted from the market value of a dwelling, the residue that remains is the land value. Therefore, the residual method of valuation for land is the best method to research the effects of sustainability.

*7. What is the effect of these parameters on the value of land in the future?*

In the first years of the introducing of BENG, higher construction cost will play a major role and can lead to lower land values when the market value of the dwelling will not rise in the same line as the construction costs, but this is more dependent from the market than from sustainability. Nevertheless, several ways have been found by interviewees to counter this negative effect on the land value. These ways are described in the recommendations.

*Central question: What is the effect of sustainability on the value of new dwellings and land?* From the mixed methods can be concluded that sustainability does have an positive effect on the value dwellings, now and in the future and also on the sales time of dwellings. But also other parameters does affect the value of dwellings, so it keeps difficult to exactly examine how much the effect is of sustainability. An assumption is that non sustainable dwelling will have a decrease in value while sustainable dwellings will keep the same value or have a small increase in their value. The parameters of land value are both affected by sustainability when calculating residual. In the beginning the constructing costs of dwelling

will increase faster than the value will increase. This means a negative effect on the value of land. Later, the construction costs will decrease and the value increase, in this scenario, the effect on the land value will not very big. From the interview respondents, some advice is given to handle with a negative effect on the land value. This is shown in the next paragraph.

## 7.1 Recommendation

A recommendation can be given for different stakeholder. The recommendation is written for real estate brokers, Gloudemans, and municipalities.

### *Real estate brokers*

This research shows that sustainable aspects are not often included in both, the valuation of a dwelling and in the residual valuation of land. When sustainable aspects are included prominently in the valuation of a dwelling, the awareness of sustainability can be increased. And therefore, the will for customers to pay for sustainability can increase. And this increase in the willingness to pay, can also lead to a higher value of the sustainable dwellings.

### *Gloudemans*

The same applies to the value of land. In most cases, this is calculated with the residual method of valuation for land. Also in this method, no or hardly any sustainable aspects are included. A recommendation is to investigate how sustainable aspects be better included in valuations and in the residual method of valuation for land. The sustainability does have an added value but is not taken into account in the residual calculation. This added value can lead to a higher willingness to pay for customers and a better awareness of the benefits of sustainability.

### *Municipalities*

For municipalities, a decrease in the land value is a financial consequence. A suggested option or improvement from an interview respondent is a better cooperation between the urban planner from the municipality and the land valuator like Gloudemans. The valuer knows how to achieve the best profit for a piece of land. When the urban planner and Gloudemans cooperate from the beginning, a more effective way of land distribution and sales can be realized.

## 7.2 Possible follow-up research

This thesis investigates the effect of sustainability on family dwellings. The effect on apartments is not researched while the costs to let apartments comply to BENG are maybe even higher than for family dwellings. Another possible future research is conducting a research into developing a new residual land valuation model were sustainable aspects are included. Next to this, the added value of sustainability can be investigated in a more detailed way. A sustainable dwellings also means lower energy bill and often less maintenance of the dwelling. These effects can, and need to be better outlined.

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## **Appendices**

- Appendix 1: Correlation matrix;
- Appendix 2: Interview topics
- Appendix 3: Interview coding;
- Appendix 4: Interview transcriptions (only on request because of privacy)

## Appendix 1:

Correlations

	Transactie_prijjs_	Transactieprijs_per_m2	Bevolkingsdichtheid_33	Dekkingspercentage_103	MateVanStedelijkheid_104	Omgevingsadressendichtheid_105	Bouwjaar_Periode	Inhoud_woning	Woonoppervlakte	Perceel_oppevrlak_	Dagen_op_de_markt	Kwartaal	Energylabel	Quality	Aantallnwoners_5	Province	Type of Dwelling	ProvinceCluster		
Transactie_prijs_	Pearson Correlation	1	.160**	.111**	.004	-.084*	.111**	.111**	.591**	.611**	.019**	-.045*	.029*	-.179	-.251**	.044*	-.320**	-.341**	-.329**	
	Sig. (2-tailed)		,000	,000	,534	,000	,000	,000	,000	,000	,002	,000	,000	,000	,000	,000	,000	,000	,000	
N		25758	25758	25733	25757	25757	25757	25758	25758	25387	25758	25758	25758	18935	25757	20748	25758	25758	25758	
Transactieprijs_per_m2	Pearson Correlation		,160**	1	.059**	.009	-.051**	.062**	-.027**	-.028**	-.055**	.006	-.030**	.007	.011	-.020**	.018**	-.091**	-.017**	-.104**
	Sig. (2-tailed)		,000		,000	,166	,000	,000	,000	,000	,000	,361	,000	,243	,066	,007	,004	,000	,007	,000
N		25758	25758	25733	25757	25757	25757	25758	25758	25387	25758	25758	25758	18935	25757	20748	25758	25758	25758	
Bevolkingsdichtheid_33	Pearson Correlation		.111**	.059**	1	-.004	-.720**	.770**	-.102**	-.163**	-.135**	-.013*	-.145**	-.006	.063**	.020**	.213**	-.264**	.346**	-.343**
	Sig. (2-tailed)		,000	,000	,481	,000	,000	,000	,000	,000	,041	,000	,343	,000	,007	,000	,000	,000	,000	,000
N		25733	25733	25733	25733	25733	25733	25733	25733	25362	25733	25733	25733	18913	25733	20727	25733	25733	25733	
Dekkingspercentage_103	Pearson Correlation		.004	.009	-.004	1	-.050**	.076*	-.010	-.016**	-.005	.023**	-.020**	-.005	.022**	.009	.206*	.021**	.020**	-.011
	Sig. (2-tailed)		,534	,166	,481	,000	,000	,000	,110	,008	,444	,000	,002	,444	,000	,227	,000	,003	,001	,080
N		25757	25757	25733	25757	25757	25757	25757	25757	25386	25757	25757	25757	18935	25757	20747	25757	25757	25757	
MateVanStedelijkheid_10	Pearson Correlation		-,084**	-,051**	-,720**	-,050**	1	-,897**	,127**	,181**	,140**	,013*	,172**	,001	-,107**	-,042**	-,277**	,234**	-,385**	,316**
4	Sig. (2-tailed)		,000	,000	,000	,000	,000	,000	,000	,000	,046	,000	,922	,000	,000	,000	,000	,000	,000	,000
N		25757	25757	25733	25757	25757	25757	25757	25757	25386	25757	25757	25757	18935	25757	20747	25757	25757	25757	
Omgevingsadressendichtheid_105	Pearson Correlation		.111**	.062**	.770**	.076**	-,897**	1	-,197**	-,177**	-,150**	-,010	-,156**	-,007	,149**	,037**	,259**	,243**	,356**	-,304**
	Sig. (2-tailed)		,000	,000	,000	,000	,000	,000	,000	,000	,097	,000	,269	,000	,000	,000	,000	,000	,000	,000
N		25757	25757	25733	25757	25757	25757	25757	25757	25386	25757	25757	25757	18935	25757	20747	25757	25757	25757	
Bouwjaar_Periode	Pearson Correlation		.111**	-,027**	-,102**	-,010	,127**	-,197**	1	,193**	,244**	-,024**	-,048**	,011	-,756**	-,211**	,035*	,037**	,051**	,013*
	Sig. (2-tailed)		,000	,000	,000	,110	,000	,000	,000	,000	,000	,000	,092	,000	,000	,000	,000	,000	,000	,037
N		25758	25758	25733	25757	25757	25757	25758	25758	25387	25758	25758	25758	18935	25757	20748	25758	25758	25758	
Inhoud_woning	Pearson Correlation		,591**	-,028**	-,163**	-,016**	,181**	-,177**	,193**	1	,863**	-,017**	,080**	,013**	-,226**	-,202**	-,064**	,031**	-,474**	,062*
	Sig. (2-tailed)		,000	,000	,000	,008	,000	,000	,000	,000	,008	,000	,037	,000	,000	,000	,000	,000	,000	,000
N		25758	25758	25733	25757	25757	25757	25758	25758	25387	25758	25758	25758	18935	25757	20748	25758	25758	25758	
Woonoppervlakte	Pearson Correlation		,611**	-,055**	-,135**	-,005	,140**	-,150**	,244**	,863**	1	,008	,080**	,001	-,278**	-,221**	-,022**	,015*	-,402**	,039**
	Sig. (2-tailed)		,000	,000	,000	,444	,000	,000	,000	,000	,000	,209	,000	,930	,000	,000	,036	,000	,000	,000
N		25758	25758	25733	25757	25757	25757	25758	25758	25387	25758	25758	25758	18935	25757	20748	25758	25758	25758	
Perceel_oppevrlak_	Pearson Correlation		,019**	,006	-,013*	,023**	,013*	-,010	-,024**	,017**	,008	1	,013*	-,008	,006	,002	,010	,000	-,039**	,004
	Sig. (2-tailed)		,002	,361	,041	,000	,046	,097	,000	,008	,209	,043	,182	,338	,761	,114	,953	,000	,486	,000
N		25387	25387	25362	25386	25386	25386	25387	25387	25387	25387	25387	25387	25387	18657	25386	20476	25387	25387	25387
Dagen_op_de_markt	Pearson Correlation		-,045**	-,030**	-,145**	-,020**	,172**	-,156**	-,048**	,080**	,080**	,013*	1	-,013*	,044**	,003	-,079*	,083**	-,195*	,103*
	Sig. (2-tailed)		,000	,000	,000	,002	,000	,000	,000	,000	,000	,043	,041	,000	,659	,000	,000	,000	,000	,000
N		25758	25758	25733	25757	25757	25757	25758	25758	25387	25758	25758	25758	18935	25757	20748	25758	25758	25758	
Kwartaal	Pearson Correlation		,029**	,007	-,006	-,005	,001	-,007	,011	,013*	,001	-,008	-,013*	1	-,012	-,005	,010	,000	,009	,002
	Sig. (2-tailed)		,000	,243	,343	,444	,922	,269	,092	,037	,930	,182	,041	,060	,528	,107	,992	,145	,708	
N		25758	25758	25733	25757	25757	25757	25758	25758	25387	25758	25758	25758	18935	25757	20748	25758	25758	25758	
Energylabel	Pearson Correlation		-,179**	,011	,063*	,022**	-,107**	,149**	-,758**	-,226**	-,278**	,006	,044**	-,012	1	,309**	-,020**	-,044**	-,047**	-,020**
	Sig. (2-tailed)		,000	,066	,000	,000	,000	,000	,000	,000	,338	,000	,060	,000	,001	,000	,000	,000	,001	,001
N		25758	25758	25733	25757	25757	25757	25758	25758	25387	25758	25758	25758	18935	25757	20748	25758	25758	25758	
Quality	Pearson Correlation		-,251**	-,020**	,020*	,009	-,042**	,037**	-,211**	-,202**	-,221**	,002	,003	-,005	,309**	1	,015*	-,002	,079**	,013*
	Sig. (2-tailed)		,000	,007	,007	,227	,000	,000	,000	,000	,761	,659	,528	,000	,035	,774	,000	,080	,000	,080
N		18935	18935	18913	18935	18935	18935	18935	18935	18657	18935	18935	18935	18935	18935	18935	14919	18935	18935	18935
Aantallnwoners_5	Pearson Correlation		,044**	,018	,213*	,206*	-,277**	,259*	,035*	-,064*	-,022*	-,010	-,079*	,010	-,020*	,015*	1	-,051*	,130**	-,101*
	Sig. (2-tailed)		,000	,004	,000	,000	,000	,000	,000	,000	,114	,000	,107	,001	,035	,000	,000	,000	,000	,000
N		25757	25757	25733	25757	25757	25757	25757	25757	25386	25757	25757	25757	25757	25757	25757	20747	25757	25757	25757
Province	Pearson Correlation		-,320**	-,091**	-,264**	,021**	,234**	-,243**	,037**	,031**	,015*	,000	,083**	,000	-,044**	-,002	-,051*	1	-,146**	,840**
	Sig. (2-tailed)		,000	,000	,000	,003	,000	,000	,000	,000	,036	,953	,000	,992	,774	,000	,000	,000	,000	,000
N		20748	20748	20727	20747	20747	20747	20748	20748	20476	20748	20748	20748	20748	20748	20748	14919	20748	20748	20748
Type of Dwelling	Pearson Correlation		-,341**	-,017**	,346*	,020**	-,385*	,366**	,051**	-,474**	-,402**	-,039**	-,195**	,009	-,047**	,079**	,130**	-,146**	1	-,258**
	Sig. (2-tailed)		,000	,007	,000	,001	,000	,000	,000	,000	,000	,000	,000	,145	,000	,000	,000	,000	,000	,000
N		25758	25758	25733	25757	25757	25757	25758	25758	25387	25758	25758	25758	18935	25757	20748	25758	25758	25758	
ProvinceCluster	Pearson Correlation		-,329**	-,104*	-,343*	-,011	,316*	-,304*	,013*	,062*	,039*	,004	,103*	,000	,002	-,020*	,013*	-,101*	,840**	-,258*
	Sig. (2-tailed)		,000	,000	,000	,080	,000	,000	,037	,000	,000	,486	,000	,708	,001	,080	,000	,000	,000	,000
N		25758	25758	25733	25757	25757	25757	25758	25758	25387	25758	25758	25758	18935	25757	20748	25758	25758	25758	

\*\*. Correlation is significant at the 0.01 level (2-tailed).

\*. Correlation is significant at the 0.05 level (2-tailed).

## Appendix 2: Topic list

Theme	Topic	Possible questions
Introduction	Length Record Anonymous	
Background interviewee	Research Goals Work Sustainability in career	
Sustainability	Concept Benefits Cons	
Law and costs	Energy label BENG Gasless	
Value and effects	Value Valuation	
Land value	Future effect Land price policy Effect now	

### Appendix 3: Coding interviews

Thema	Bedrijf	Naam	Afkorting
Beleid	Waarderingskamer		RK
	Gemeente Tilburg		ER
	Gemeente Tilburg		EW
	Gemeente Rijswijk		CR
Advies	Stec groep		EL
	Platform 31/X		TP
	Alba concepts		JT
	DUVAS advise		WL
Markt	Van den Heuvel Makelaars		FH
Bouwers	Dura Vermeer		FM

Definities	Respondent	Tekst	Open codering
		Nou, dat is op zich ook nog wel een hele interessante. Omdat we natuurlijk, duurzaamheid wel erg geënt wordt op zeg maar het energiegebruik. In de zin van, het verbruik van de woning en energiegebruik. Terwijl er in die duurzaamheid natuurlijk ook zoets inzt van jongens, hoe lang kan ik iets gebruiken. Op het moment dat ik een bepaalde energie voetprint heb om iets te bouwen, en ik heb er 10 jaar lol van. Dan is dat effect anders dan dat ik daar 50 jaar lol van heb.  Begrip: Ja dat is een hele moeilijke hea. Kijk, je hebt natuurlijk woningen die wat dat betreft natuurlijke ventilatie hebben noem ik het wel eens..omdat je door de vloer zakt zo oud ze zijn. Het laten staan van de woningen, is dat duurzaamheid? Want bij nieuwbouw wordt er ook weer behoorlijk wat energie en grondstoffen verbruikt. dus ja, wat is duurzaamheid? Je kunt er van alles voor verzinnen. Maar om hier iets goeds over te zeggen, daar moet ik me dan in verdiepen. Op lange termijn, en hoe is het in gebruik. En denk ook aan milieu vriendelijke productie methoden, gedurende periode dat het er staat. En zo lang mogelijk.	Niet alleen verbruik. Maar ook materiaal.
		Voor mij betekende het toen, dat bij vooral de energetische duurzaamheid iets moet gaan doen, omdat ik als een soort hobby bezig ben om mijn energie rekening thuis zo laag mogelijk te krijgen. Puur Hollandse zuinigheid	Het gebruik.  Duurzaamheid. Energetica.

Maatregelen	Bron	Tekst	Open codering
		Maar wat je wel ziet, het is wel opvallend, dat je in zoekcriteria, bijna nooit het zoekcriterium energie label A wordt opgenomen  Gasloos, daar zit een hele wijk, ik geloof 20 / 25 woningen staan hier aangesloten op een centraal punt van een warmtepomp systeem. Die hebben al geen gas meer binnen. Alleen elektrische koken, alleen vloerverwarming. Dus ja, of ik het gas loos bouwen als haalbaar zie? Ja nieuwbuw sowieso wel. Ik denk dat dat echt geen issue gaat worden. We hebben steeds nieuwe ontwikkelingen qua warmte opwekking en nieuwe manieren van verwarmen. We kunnen dit steeds goedkoper maken. Ik dat als de ontwikkelingen zo doorgaan dat de warmtepompen ook steeds goedkoper zullen worden. Dus voor nieuwbuw is dit echt geen probleem	Zoekcriteria. Energielabel  Gasloos. Ontwikkelingen. Goedkoper

Maar de ambitie voor alle woningen in 2050, dat vraag ik mij af. Want dit betekend ook hele aanpassingen in je installaties, aanpassingen bij indelingssituaties van oude woningen, waar ga ik met de pomp naar toe, waar gaan mijn leidingen heen? en is dit wel betaalbaar? Met name het betaalbaarheidsaspect gaat alleen lukken met subsidiemaatregelen. Anders heb ik daar wel zeker een hard hoofd in.

Oude woningen. Haalbaarheid.

Ik denk dat zelfs de 30+, of de rijke millennial alsnog vooral naar meer ruimte zal gaan kijken zoals een vrijstaande woning dan een tweekapper met een warmtepomp.

Millenials. Vrijstaande woning.

Als we kijken naar de opwarming van de aarde, dan moeten we wel. Maar als dit niet gestimuleerd wordt, zeker voor bestaande bouw, dan zou het een heel moeizaam proces worden

Opwarming aarde. Stimulatie bestaande bouw

Als je een woning hebt met een A of B label, dan stook je per jaar een bepaalde hoeveelheid minder. Dus als je dit zou vertalen, dan zou je dus meer voor die woning kunnen betalen. Theoretisch gezien.

Hoger label. Minder stookkosten.

Behalve als er dus andere maatregelen gaan komen. Zoals, als men gaat verhuizen, dat je alleen mag verhuizen naar een woning met een hogere energielabel. Dan worden die woningen dus een schaarste goed, en dan gaat de waarde dus omhoog. Dat is dus een beetje het ding. Je weet dus niet wat er gaat gebeuren. Als je gaat verhuizen, ga je dan de woonvergunning weer invoeren? Dat je dus moet aantonen dat de woning een B label of hoger heeft. Dan gaan we dus opeens allemaal op zoek naar woningen met een B label.

Verhuizen. Duurzaam huis.

Het blijkt dus uit de theorie en de praktijk, als je kijkt naar energielabels en het verbruik van energie. Dat het juist andersom is, dat mensen in een D label woning wonen, in verhouding, veel minder energie verbruiken dan je eigenlijk in theorie berekend door een D label.

Minder verbruik. D label.

Op internet kun je als je, je woning wilt verkopen, dan kun je voor een paar tientjes een label aanvragen.

Label. Aanvragen.

Nou zijn de energielabels in het woning waardeer systematisch versleuteld. Label D woning krijgt maar 10 punten. En per punt zeg maar 4 a 5 euro. Dus als je naar een label A woning gaat of hoger, je een forse verhoging krijgt van 20 punten. Dan mag je in principe 100€ meer huur vragen aan een nieuwe huurder. Bij een zittende niet, maar bij een mutatie mag dit.

Hoger label. Meer huur.

Hij is zuinig als jezelf genoeg zonnepanelen op het dak kan stoppen. Om hem te laten draaien. Dus de kosten die je hebt om energie te kopen, die doe je daarmee weer opwekken. En als we van gas af zijn, dan zijn we ook Putin proef. Dan zijn we niet meer afhankelijk van een ander.

Gasloos. Putin proef

Waarom niet gewoon gefaseerd niet duurzame energie verbieden. Dan lost alles zich toch makkelijk op. Alle subsidies afschaffen.

Niet duurzame energie. Verbieden.

En dat beleid in 20 jaar uitfaseren, dan moet er duurzame energie voor in de plaats komen. Deze kost wel meer dan de huidige vervuilende CO<sub>2</sub> energie. Plus een woning die meer energie vraagt wordt dus per definitie duurder, en dan ontstaat er een drive om nieuwe technieken en innovaties toe te passen. Maar lokaal opgewerkt maximaal, en isoleren maximaal. Waardoor je maandsom van wonen in ieder geval beheersbaar blijft. Meer hoef je niet te doen. En laat dan maar aan de markt over om met innovaties te komen.

Uitfaseren. Meer innovaties.

Ga dan met slimme systemen werken, of met ander soort systemen. Wat zij dan bijvoorbeeld doen is met infrarood panelen. En dan niet wat je bij een terras ziet. Maar juist een soort scherm. Die kun je aan het plafond hangen. En die gaan niet zoals een met vloerverwarming de hele woning verwarmen. Maar gaan alleen stralen op de plek waar je savonds tv zit te kijken, of boven je eettafel.

Infrarood panelen.

Er gaat een niche zijn. Die de jaren 30 belangrijker vind qua uitstraling en op de koop toe neemt dat het comfort niveau qua warmte anders is. Ik wil niet gelijk zeggen minder, maar het is anders. De techniek gaat voort, maar het zal zeker anders zijn

Jaren 30. Ander comfort.

En ik denk en merk in het beleid. We moeten ons voorbereiden op de verkiezingen die er aan zitten te komen in maart. Zo van, wat gaan we mee geven aan de partijen die met elkaar een college gaan vormen. Ja, duurzaamheid, sociale stijging, armoede problemen. Dit zijn de 2 thema's. En daarna heel lang niets.

Beleid. Duurzaamheid.

Haha dat weten wij niet, ja wij hebben geen klimaatplan, maar een klimaat traject. En daarop hoort mobiliteit. Niemand die het weet. Niemand die het weet. Iedereen, je mag wel mensen uitlachen die denken dat ze weten hoe het gaat plaatsvinden. Ik ben er wel van overtuigt, het gaat plaatsvinden. Maar niet via welke technieken. Elke dag komen er nieuwe technieken bij. Elke dag worden er weer hoekjes waarin energie verborgen zit blootgelegd. En dus we hebben niet zo zeer een plan, zo gaan we het doen, maar wel meer een traject

Gemeente. Behalen doelstellingen.

Nou, waar wij het in het begin al over hadden, als er straks geen fossiele energie meer te koop is, dan is die stimulatie al helemaal niet nodig. Dan laat je aan die mensen zelf over, om te kiezen wat het beste voor die locatie is. Dan kunnen ze zelf kiezen wat ze willen nemen. Dan gaan ze waarschijnlijk zelf isoleren, omdat energie per kilowatt zo duur is geworden

Geen stimulatie nodig. Verbod fossiele energie.

Jawel, die EPC is de meeste effectieve maatregel geweest die er bestaat. We bemoeien ons niet met hoe je het doet. Maar dat je het doet. We gaan het verbieden. Dat weet je 10 of 20 jaar van te voren. Ik hoor nooit meer bij een ontwikkelaar dat ze klagen over de EPC. Niemand doet er moeilijk over, en voor iedereen is het speelveld gelijk. Er valt dus te concurreren op slimmer die norm halen, maar niet op een minder presterende woning. Hooguit juist een woning die meer presteert, zo van mijn woning is energie neutraal. Wij hebben hier een project, puur een ontwikkelaar die van ons grond heeft gekocht zonder korting, die heeft nul op de meter woningen gerealiseerd.

Niet hoe je het doet. Maar hoe je het doet. Niemand doet meer moeilijk over EPC

En nogmaals, niemand die het weet. En over 3 jaar hebben wij een nieuw kabinet. en dan kan het allemaal weer anders zijn, met het beprijen van de CO<sub>2</sub>. En misschien, dat wat Emrito al zei, dat een ton CO<sub>2</sub> zo duur kan worden, dat bedrijven. Want we hebben nu steeds wel over woningen, maar dat is natuurlijk maar een fractie van uitstoot. Want als we het verkeer enz. gaan mee gaan rekenen. Want nu tanken we bij een tankstation, en straks bij een woning. Dus dan heb je nog een paneel extra nodig. En laat staan dan die vrachtwagen die de industrie gaan bedienen.

Beprijzen van CO<sub>2</sub>

Dat hij zelf op die manier al goed beloond is. En je moet nu niet alle woningen terug slaan. hij heeft relatief grondgebonden woningen, mogelijkheden zijn hier anders. En voor vrije woningen zal je misschien meer stimulans moeten inbouwen. Maar hier moet je heel voorzichtig mee zijn. Laten we maar gewoon gaan gebeuren, en kijken wat de ontwikkelingen zijn, zonder dit te beprijen.

Bepaalde categorie stimuleren.

Duurzaamheid en betaalbaarheid gaan hand in hand. De armoede bestrijding begint gewoon met betaalbaarheid, maar kan bijna niet zonder duurzaamheid.

Je kan zonnepanelen hebben, maar uiteindelijk heb je een aansluiting nodig op het reguliere net, want de accus zijn nog niet zo goed. Wat zullen de lasten voor vastrecht worden? Er werd jaren geleden gesproken over het stijgen van energie contracten. De contracten die ik telkens zie, is dat de tarieven juist omlaag gaan, alleen gaat de belasting juist elke keer omhoog.

Belasting omhoog.

Dan kost het eigenlijk niets meer of minder. Dus dan zou je het moeten gaan zien, levert het woongenot op of niet. En ja, uiteindelijk zullen we als Nederland wel van het gas af moeten, al dan niet door Groningen. En anders dan wel vanwege de afhankelijkheid van buitenland (Rusland). En ik zie het dus op zich wel als een opgave of een gegeven dat we aan moeten gaan. Maar het is moeilijk om in te schatten wat het precies gaat doen voor de woningen. En initieel kost het waarschijnlijk meer. En er zijn verscheidene subsidies nog die de initiële kosten zullen drukken. Dus ja, ik vind het moeilijk om hier een inschatting over te maken. Dus ook hier zou ik aangeven, 1/3e voor de koper, dus bovenop de vrij op naam prijs. En ja, 1/3e voor de bouwers en ontwikkelaars, en 1/3e voor de overheid.

Gasloos. Woongenot

Dat is heel erg verstandig ja. En kijk, aan de ene kant, we hebben het gehad over een bepaald segment. Laten we dan maar de starters noemen. Je moet als gemeente heel erg oppassen voor object subsidie. Dit is een subsidie voor een bepaalde woning bijvoorbeeld. Je kan wel doen aan subject subsidie. Dus subsidie van mensen. Denk aan huursubsidie, huurtoeslag. Je krijgt als persoon vanwege je inkomen een toeslag of een subsidie. Dat kan wel

Object subsidie. Subject subsidie

een starter die de sleutel omdraait van een nieuwbouw woning, en die woning is gelijk 25 tot 50 duizend euro meer waard dan waar hij hem voor gekocht heeft. Maar je kunt als gemeente beter zorgen dat je bijvoorbeeld iemand die voor het eerst een woning koopt, in de bestaande bouw, met een bepaald energie label, goedkopere lening krijgt, onder de voorwaarde, dat hij deze bestaande woning 3 a 4 labels verbeterd. Dat is 1 van de maatregelen die je zou kunnen nemen

Leningvoorwaarde. Label verbetering.

Daarnaast moeten gemeenten zich beseffen dat, stel dat je een heel ambitieus nieuwbouw programma hebt voor de aankomende 20 jaar. Hoeveel procent van de voorraad voeg je toe, of sloop je? Dat zou 4% zijn, als je ambitieus bent. Dus hoeveel procent die er 2050 zijn, staat er nu al? Dat is 80 a 90%, dus als je voorraad in 2040 of 2050 op een fatsoenlijk niveau wilt hebben, dan moet je zorgen dat je vooral die bestaande bouw aanpakt. En dat is moeilijk. Helemaal omdat een grootdeel in bezit is van particulieren partijen. Je kan ook niet zeggen dat dit partijen zijn die altijd geneigd zijn om investeringen te doen. Je moet duidelijk communiceren, wij zorgen voor voordelen

Ambitieus programma. Duidelijk communiceren.

## Waarde & Waardering

Bron

Tekst

Open codering

Gedateerde woningen zijn veel lastiger om te verkopen. Ook al is jouw prijs onder de getaxeerde marktwaarde.  
Je ziet dan dat een woning, die helemaal up-to-date is heel goed verkocht wordt. En over het algemeen snel verkocht.

Gedateerd. Lastig verkopen.

kijk waar zonnepanelen , ja dit heeft voor ons een toegevoegde waarde in bijv. de taxatie methodiek. En in sommige gevallen moet je het ook uitsplitsen, want duurzame voorzieningen, en zeker als je deze nog moet aanbrengen als koper, die mag je voor een deel extra mee financieren, maar dan moet die extra medefinanciering wel besteed worden aan de duurzame voorzieningen, zoals een zonnepanelen, een HR kerel, noem maar op.  
Bij verkoop van woningen, ik krijg eigenlijk geen vraag van kopers van, goh is de woning voorzien van zonnepanelen, of is de spouwmuur geïsoleerd.

Up to date. Goed verkoopbaar.

Ja kijk, locatie en de aantrekkelijkheid van de woning, en wat je ervaart zijn veel belangrijkere factoren, kijk je moet een klik hebben met de woning. Je moet het juiste gevoel hebben. Dat gevoel krijg je niet van 6 zonnepanelen op een dak.

Duurzaamevoorzieningen. Mee financieren.

Het gaat dus echt om de locatie en de luxere faciliteiten van een woning.

Kopers. Geen vraag naar duurzame voorzieningen.

Dit is niet direct zichtbaar in de taxatie zelf. Maar wij nemen wel in een paragraaf op de duurzaamheidsvoorzieningen aanwezig zijn in een woning, en zo ja, welke? Warmtepomp, lage temperatuurverwarming, extreem goed geïsoleerd, dat soort dingen. Dan vermelden we dat. We gaan dit niet uit specificeren van, dit is de marktwaarde, en deze duurzaamheidsaspecten voegen dit toe aan de marktwaarde. Dit vergelijken wij met min of meer dezelfde woningen die verkocht zijn. Als er dan niet heel veel woningen zijn met duurzame voorzieningen ga je ook kijken naar andere woningen. Dan zie je ook weer, hij is wat beter geïsoleerd, en hij is wat jonger, deze woning brengt om die en die reden wat meer op. Dat is het enige wat je kan zien.

Aantrekkelijkheid. Negatief. Zonnepanelen. Locatie en faciliteiten waare bepalend.

Nee, wij doen daar bijna niets mee. Als wij duurzaamheid noemenswaardig vinden, dan nemen wij het op in het rapport, en anders niet.

Taxatie. Indirect in paragraaf.

Nou we hebben jarenlang zitten zoeken in markcijfers, verkoopcijfers etc. om het verband te vinden tussen duurzame maatregelen en de waarde. Is die t vinden? Nee! Theoretische klopt het dus helemaal. Je weet dat je zoveel kan uitgeven aan woonlasten, en als je dan minder uitgeeft aan energie, dan kun je meer uitgeven aan de woning zelf. Dus theoretisch moet het effect er zijn. Maar het heeft zeker een jaar geduurd voordat er na empirisch onderzoek duidelijk werd dat er een effect aanwezig is. Misschien dat als je de hogere labels hebt, kun je het effect terug vinden  
En eigenlijk zie je dit vertraagt nu een beetje bij het commercieel vastgoed terug komen. Hier heb je nog veel meer, dat bedrijven, bedrijfsmatig geacht worden om te denken. En denken in van, wat zijn mijn totale huisvestingslasten. Hier zijn al een hoop vernieuwingsprogramma's van gebouwen op gericht.

Taxatie. Duurzaamheid.

Geen verband tussen duurzaamheid en waarde

Commercieel vastgoed meer verband

Je ziet het niet terug komen in huurprijzen, verkoopprijzen etc. Maar wat zie je nu? Dat het wel in de markt begint terug te komen. Maar nog steeds niet in huurprijzen. De huurmarkt is er dus nog niet gevoelig voor, maar wel de beleggingsmarkt die er gevoelig voor aan het raken is. En dat is niet gericht op het feit door meer huurinkomsten etc., maar juist het risico aspect. Over; dadelijk komt de regelgeving eraan, en dadelijk zit ik met een voorraad die ik dan aan de straatstenen niet kwijt kan. Dit is niet te verklaren vanuit energie rendementen etc. maar alleen maar vanuit een risico inschatting

Komt terug in de markt, nog niet in de prijzen. Regelgeving

En je krijgt dus iedere keer terug, en ik dus wel op gegeven moment tot de constatering komen dat woningen met een A label meer in de markt stijgen en een hogere vierkante meter prijs hebben. Maar is dat nou omdat hij een A label heeft, of omdat hij nou juist in de laatste 15 jaar is gebouwd. Of omdat het allemaal woningen zijn die sowieso luxer zijn uitgevoerd etc elkaar. En je gaat het dus pas merken als je 2 woningen, gebouwd in het jaar 2000 etc., en de één is inderdaad met een A label en de ander met een D label. En dan zou je het gaan zien. Maar dat soort verschillen zijn er natuurlijk veel te weinig om dat echt te zien. En daarom is het wel heel erg lastig om het empirische bewijs (van jongens hoe zit het nou in de markt?) te vinden.

Ligt het aan het label? Of aan bijv. bouwjaar?

Dus dat maakt het heel erg moeilijk, maar aan de andere denken we dus dat het wel moet werken. Energiekosten gaan steeds belangrijker worden, als we steeds meer energie gaan gebruiken, dan wordt het er ook niet goedkoper op in zowel gas elektriciteit en dat soort dingen. Het zal voor de huisvestingslasten in zowel de woonafscheer als huisvestingsfeer, als bedrijfsfeer gaan het een steeds belangrijkere afweging zijn. Dus theoretisch gezien zeggen mensen van jongens, daar moeten mensen steeds meer aan denken

Empirisch bewijs is heel lastig nog

Volgens mij kun je nog steeds niet zeggen dat op het moment dat ik €20.000,- wil investeren in zonnepanelen of isolatie of wat dan ook, komt dat dan ook terug als €20.000,- waardestijging in mijn woning? Idealiter zou het zelfs meer zijn, want dat zouden we het gelijk met zijn allen als een idioot gaan doen. Want als je dan in duurzaamheid gaat investeren heb je er alleen maar profijt van. Maar over het algemeen is het met investeringen in vastgoed zo, dat je het gedeeltelijk doet met het idee dat er een waardestijging in zit. Maar je moet er ook anders lol mee hebben. Want als je er €20.000,- instopt mag je blij zijn dat je er €10.000,- aan over houdt. Dus dan zeggen we jongens, als je een stukje hiervan terug ziet, dan is het mooi.

Energiekosten en het belang ervan

Nou wij hebben dus zelf heel erg lang al de discussie met, zou je niet gewoon standaard een duurzaamheid parameter. En dan komt het energielabel als eerste om de hoek kijken. Omdat deze gestandaardiseerd is, moet je deze er niet bij betrekken. Dus daarom willen wij zorgen dat wij deze meenemen in de marktanalyse. En op het moment dat daar voldoende uitkomt. Dan moet je dit ook in je taxatie meenemen. Tot nu toe, de verwachtingen zijn niet zo hoog van en ja, de effecten die het heeft, zijn kleiner dan de nauwkeurigheid van je taxatie

Nog geen waardestijging

En dat komt dus ook af en toe terug in de politiek. Dan zeggen we ja jongens, op het moment dat we willen investeren in woningen en duurzaamheid, dan moet je dat niet afstraffen met een hogere WOZ waarde. En dat kom je overal tegen, bij alle vormen van investeringen die je doet komt dat af en toe terug. We hebben ook politieke discussie gehad, dat al ik een woning ga aanpassen voor iemand die invalide is, dan word ik daarvoor gestraft op mijn WOZ waarde. Dus iedere keer komt die discussie terug, maar dan proberen wij aan te geven van, je moet wel heel voorzichtig zijn, want op het moment dat je voor een aantal doeleinden de waarde van een woning wilt gebruiken, dan moet je geen beleid gaan voeren hoe hoog die waarde is. De markt bepaald hoe hoog de waarde van een woning is. Bij bijv. een hoop investeringen voor invaliden, zie je dit niet in marktwaarde terugkomen

Duurzaamheids parameter

Dan kun je zeggen van, jongens, ik investeer €20.000,- in energie maatregelen, en krijg er een WOZ waarde bij die 5 tot €10.000,- hoger wordt. Ja wat betaal ik dan paar jaar extra aan belasting? Dat zijn hooguit een paar tientjes. Dus ik ga toch niet, niet €20.000,- investeren omdat ik een paar tientjes meer ga betalen. Dat is toch wel de nuancing die je erbij moet zetten. Het klinkt natuurlijk heel erg, dat je een WOZ waarde krijgt die €5000,- hoger ligt, dat betekend niet dat je €5000,- betalen

Markt bepaald

WOZ waarde en duurzaamheid

En op het moment dat het dus echt zo is, dan ga je categorieën woningen zien, die echt gewoon een andere markt ontwikkeling gaan krijgen. En dat hebben we best afgelopen periode gehad. Categorieën woningen met een andere markt ontwikkeling, maar daar zat het duurzaamheidsaspect amper in. Ik bedoel, na de crisis zag je een groot verschil in de ontwikkeling van woningen waar je zo in kon en woningen waar je echt wat aan moest doen

Markt ontwikkeling

Op het moment dat je in een omgeving zit, waar een beginnende markt hebt enzo, dan heb je heel sterk het risico, dat als je een massale taxatie gaat neerleggen, dan krijg je het risico dat mensen zeggen; dat zal de markt dus wel wezen. En dan ga je dus niet de markt verklaren, wat wij in Nederland best wel goed doen met het WOZ systeem. Maar dan ga je de markt juist maken. Dat soort dingen, ik bedoel, op het moment dat je hard gaat roepen, we zijn er nu uit, en op het moment dat je een A label hebt, dan gaan we 5% bij de waarde erop tellen. Dat is natuurlijk harstikke leuk en kun je dat in een taxatie doen, maar dan ga je ineens zeggen dat jij dat in de markt dus schijnbaar ook moet gaan doen. En dan gaan we dus niet de markt lezen zoals je in een markt analyse doet, maar dan ga je de markt maken. En daar willen wij heel erg vanaf blijven.

Markt analyse en waardestijging

Ik bedoel een paar jaar geleden hadden ze hier in de stad Den Haag zo een markt analyse van jongens, van oudsher was het altijd zo in die jaren 50 portiekflats dat mensen niet wilde trappen lopen, dus de eerste verdieping was duurder dan de vierde verdieping want ja, dan moet je meer traplopen. Op gegeven moment is dat omgedraaid, nu is de vierde verdieping duurder dan de eerste verdieping. Dat komt door minder risico op inbraken.

Onverwachte waardeveranderingen

Wij hebben geen vaste parameters, wat er in komt wordt door de markt bepaald. Dat gaat het om, bouwjaar, type en nog een aantal dingen, dat is de kern van het ding. En daarna heb je dan de faciliteiten, de berging, de schuren en dat soort dingen die bijgebouwen en dergelijke. En voor de rest heb je de categorie van, jongens, wat zijn nu de kwaliteitselementen. Dus kwaliteit hebben we eigenlijk in twee categorieën. In gebruikte materialen van bouwtechnische kwaliteiten en kwaliteit in de zin van voorzieningen niveau, van, hoe luxe is alles en dergelijke. Verder heb je onderhoud, die zit ook in twee categorieën. Buiten de constructie heb je dak problemen en funderingsproblemen en dergelijke VS het dagelijkse onderhoud etc. Nou dat zijn belangrijke dingen, en daarna heb je natuurlijk de dingen die in de omgeving zitten, maar die hebben minder met de duurzaamheidsaspecten te maken.

Parameters en duurzaamheid

Maar het is in die kwaliteitsaspecten, en duurzaamheid zien we toch wel als een kwaliteitsaspect. Ja dan kun je dat eigenlijk niet doen, en ja oke, die hele feitelijkheden, daar hebben we ook al over gesproken. Dan kun je zeggen, ja jongens, hoeveel zonnepanelen er op die woning zitten. Of hoeveel vierkante meter zonnepanelen. Maar dat zegt uiteindelijk ook niets. Want op het moment dat ik een zonnepaneel heb liggen van 10 jaar geleden. Uh dan was 2m<sup>2</sup> zonnepanelen iets heel anders dan nu. Want ook qua rendement is hij nu factor 4 a 5 beter dan die oude. En wat zegt dan vierkante meters? Moeten we het piekvermogen gaan noemen?

Kwaliteits aspecten en duurzaamheid

Het is de vraag hoe duurzaam dat is natuurlijk, ze voegen mechanische ventilatie toe, en pimpen die hele flat. En de schil pakken ze goed in, dus ze isoleren goed. Dan zie je dat de marktwaarde verhuurde staat van de woningen met €40.000,- stijgt. Dat is ongekend inderdaad. Maar dat heeft dus niet alleen te maken met de verduurzaming van deze flat. Maar juist ook met de locatie. Rotterdam, Amsterdam, Utrecht, dat is natuurlijk allemaal booming. Iedereen wil daar wonen. Kijk de investering die ze daar gedaan hadden was, 40, 45 duizend euro per woning. En die investering is dus op papier in principe al terug verdient.

Extra kosten, €40.000,- per woning

Ik ben bijvoorbeeld in Oss gaan rondrijden, en toen zag ik een huis waar iemand gewoon BAM allemaal zonnepanelen vlak tegen de gevel aan had geplaatst. Schuin omdat het anders tegen de topgevel niet paste enzo. En dat ziet er gewoon niet uit. Ik zou dan juist denken dat dit gewoon een waardevermindering is voor deze woningen. Omdat het esthetisch gewoon niet klopt.

Duurzaamheid, Estaticch niet aantrekkelijk

En misschien was het label D, en is het nu een label B of A. Dus ze gaan in Label stappen wel omhoog. Maar a, gaat er dan iemand dan meer door betalen? Nee, dit komt vooral omdat het model hierachter ontbreekt. We zouden het ontzettend interessant vinden als er een netto contante waarde berekening simpel opgezet kan worden. Van he, als iemand die maatregelen treft, dan rekenen wij uit dat u zoveel kilowatt uur de vierkante meter minder verbruikt. Dus energie besparing, die kun je uitdrukken in de energie lasten, dus in geld. Zo zou je het in de loop van jaren netto contant kunnen maken. Zo is het hoe ik het in ieder geval voor me zie

Niet meer betalen door beter label. Model ontbreekt

Om te kijken naar wat het resultaat is. En nu kun je bijvoorbeeld bij een bang, triodos, rabobank. Deze geven bijvoorbeeld 2 tiende korting op je hypotheek, En dit is toch wel heel interessant als je het bedrag kan mee financieren. Wat jij straks als meerwaarde eruit krijgt. Dan is het probleem opgelost.

Meefinanciering banken

Maar BENG is wel even iets anders dan Nul op de meter. En alles wat voor 2021 komt, valt onder het vorige bouwbesluit. Vanaf 2021, is BENG waarbij de helft fossiel kan worden opgewekt. En ook de isolatie kan lager zijn dan wanneer je echt bij nul op de meter gaat. Maar nog steeds zit er tussen BENG en nul op de meter ook een waarde verschil.

Waardeverschil BENG en Nul op de meter

Van hoe zich dat gaat ontwikkelen, als er straks veel woningen zijn toegevoegd die energetisch zeer efficiënt zijn. Hoe gaat dat zich, wat voor gevolgen gaan dit hebben. Voor die woningen die nog na die 30 jarige woningen die bijna niet zonder onverantwoord veel investeren, beter dan een B label kunnen worden? gaan die daar last van krijgen?

Waarde van niet efficiënte woninge.

Ja, ik denk dat op dit moment het nog nauwelijks wordt gewaardeerd in de waardering van woningen (dat de systemen ook kou opwekken in de zomer. Dat je ook kou geleverd krijgt. Comfort waarderen).

Comfort. Waarderen.

En de kosten worden lager. En als ik niets doe, dan heb ik een woning met minder waarde, minder comfort, en hoger energiekosten

Geen verandering. Minder waarde.

Dit kan bij corporaties een mooie rol gaan spelen bij de opschaling. Die kunnen heel hun portefeuille, 30 jaar vooruit kijkend. Die begroting staat al zo. Zij kunnen dan al zeggen. Wij gaan investeren, want wij zien die waardestijging. Dit komt ook omdat die techniek steeds beter wordt. En bouwbedrijven beter in staat zijn om sneller te kunnen renoveren. En dit heeft ook te maken met hoe lang iemand zijn huis uit moet om deze woning te kunnen renoveren. Dit zijn ook allemaal kosten aspecten. Dus als hier ook echt een versnellings cyclus in gaat komen. En sneller op maat toegepaste systemen. Dan gaat dit ook in het particuliere en private deel van de woningvoorraad allemaal voordelen opleveren. Want mensen zien, dit doet dus iets in de prijs van woningen

Corporaties. Opschaling. Waardestijging.

Het is altijd moeilijk, want die woningen zullen nooit exact op dezelfde locatie staan van niet BENG woningen. Want die zijn eerder gebouwd en op andere locaties. Dus als deze daadwerkelijk kwaliteit hebben, dat is moeilijk te vergelijken. Ik verwacht overigens wel dat er een deel terug te vinden is in een hogere vrij op naam prijs. Want als je puurder of beter gaat kijken. Dan moet je kijken naar wat de vervolg prijzen zijn. Wat is deze woning waard als een verkoper deze woning gaat doorverkopen aan een andere koper.

Vergelijken van woning waarde.

Ik ben wel overigens van overtuigd, dat voor dezelfde soort woningen op dezelfde soort locatie, dat deze woningen wel wat meer waard zullen zijn. Het zou anders wel erg jammer zijn voor mensen die het wel gekocht hebben en de extra investering hebben gedaan. Wat, ik heb net ook al aangestipt, voor het overgrote deel van de kopers, of de consument, is de besparing en de terug verdientijd, is van groot belang. Het type maatregel dat genomen moet worden om de woning echt BENG te maken is daarbij best belangrijk. En wat voor maatregelen, of regelgeving de overheid gaat instellen, is ook van best grote invloed.

Terugverdientijd. Hogere waarde.

Maar je moet vooral kijken waar je stappen zou kunnen maken. Als je bijvoorbeeld in een stad als Delft gaat kijken, hele dichtbevolkte gebieden, waarbij gestapeld woningbouw, waar in principe een heel cv net in zit. Dit kun je redelijk simpel aansluiten op een warmte net, en dan maak je redelijk snel stappen, maar vooral beginnen met deze woningen te isoleren, anders schiet het niet op. En dat zijn forse investeringen die beleggers en corporaties denk ik wel kunnen maken, maar particulieren, ja.

Simpel. Stappen maken.

Als je dan na een aantal jaar, eenmaal een soort volume hebt. En de mensen die daar wonen zijn heel erg enthousiast. Dan ontstaat er een soort groep mensen die jouw ambassadeurs worden. En dat is moment dat je kan spreken van waardecreatie. Want je ziet in Rijswijk Buiten. Dat met name in het segment rijwoningen . een sterke waarde vermeerdering plaatsvindt. Mensen kiezen voor Rijswijk buiten vanwege de duurzaamheid. In het dure segment zie je dat het niet zo is. En ja eigenlijk niet interessant vinden of het nu nul op de meter of wat dan ook is. Dus eigenlijk heb je een bepaalde schaalgroottes nodig om die waarde creatie te krijgen. En je ziet dat nu dus gebeurd dat.

Ambassadeurs door meer volume

Innovatie	Bron	Tekst	Open codering
		<p>En dat is nieuw voor een energiebedrijf. Dat zij zich moeten gaan verbinden met mijnbouwers. Dat hebben ze nog nooit gedaan in die zin. Maar Brabant water bijvoorbeeld haakt er op die manier ook bij aan. Zij zeggen; die technieken hebben wij wel. Want wij halen water uit diezelfde lagen. Dus benut onze kennis ook maar.</p> <p>Ja, je ziet dus ook die koppelingen komen van bedrijven die wij niet voor mogelijk hielden. Dus daarom zeggen wij als gemeente ook niet van, wij gaan een plan maken hoe we het gaan doen, want wij hebben geen idee. Maar we gaan met iedereen samenwerken en elk hoekje gebruiken. Decentraal, centraal, alle bij elkaar vegen.</p> <p>Dat wou ik gaan zeggen. Je ziet nu dus die nieuwe technieken ontstaan, bijvoorbeeld het internet, dat 20 jaar er nog bijna niet was. En nu wel, wat voor partijen daar allemaal ontstaan en wat er omheen vloeit. En dat ga je ook bij warmte en elektra zien. Allemaal dingen, organisaties die we nog niet kennen. Maar reken er maar op dat dat gaat gebeuren, en dat die er gaan komen de komende 10 jaar.</p> <p>En wij hebben zo iets van, de snelheid waarmee wij het nu zien gaan, die kunnen wij bijna niet bijhouden. Want in om het in projecten te implementeren, en het een plek te geven. We hadden het net al over een kippenboer die warmte wil afleveren, hier is de wereld niet op ingericht. Maar de wereld zal zich gaan voeren naar de kippenboeren.</p> <p>Zorgen voor innovaties, waardoor goedkoper oplossingen komen, om te verduurzamen. En vooral mensen die informeren over de combinatie woongemak en verduurzamen.</p> <p>Wij hebben nu woningen vanuit Dura Vermeer. Dit zijn IRIS smart woningen.</p> <p>Vanuit de bouwwereld zijn er vergeleken met de auto wereld weinig innovaties te zien.</p>	Nieuwe technieken. Samenwerking. Nieuwe organisaties Snelheid van projecten. Innovaties. Goedkope oplossingen.
Kosten	Bron	Tekst	Open codering
		<p>Maar dit is ook niet echt mijn tak van sport. Dan kom je toch echt meer bij de ontwikkelaar / bouwer terecht. Maar ja, als de markt ons dwingt, dan zullen wij wel moeten. Ik ben alleen wel benieuwd of dit zijn weerslag krijgt in de prijs en aantrekkelijkheid van een woning</p> <p>je kan nog zo energiezuinig zijn. Maar twee derde van je rekening zijn belastingen. Dan kun je nog wel bezig zijn met energie besparen, maar met alle respect. Je kan met veel pijn en moeite met je energierekening van €150,- terug gaan naar €130,-. Maar als dit dat wilt terug brengen naar €110,- maar vervolgens €10.000,- moet investeren.</p> <p>En als ik deze wil verbouwen, en ik moet voor €15.000 investeringen doen om mijn woning duurzaam genoeg te maken, en ik kan dit over 15 jaar terug verdienen, dan heb ik misschien al lang andere plannen. En dit terwijl mijn toekomstvisie, wel heel erg anders zou kunnen worden. En ik de wens heb, zoals als veel mensen na 6 jaar. Die willen toch vaak een 2 kapper, of een eigen oprit</p> <p>Kijk, energiezuinigheid is alleen voordelig voor jou al particulier als jij dit direct in je portemonnee ziet. Want kijk, onderhoud van de pomp kost ook geld, en vastrecht betalen waarbij de energie verbruik ook gekoppeld wordt aan de energie index. Dan ben je per saldo niet veel goedkoper uit. Die woningen verbruiken dus geen gas meer en zijn energie zuiniger, maar zijn dus niet perse goedkoper.</p> <p>Ja, ook hier zie je dat de markt een grote rol speelt. De vraag op dit moment voor bouwers is zo groot. Dat als ze al een start-bouw willen realiseren, dan hebben ze al een wachttijd van 6 maanden. Op heipalen zit bijvoorbeeld al een levertijd van minimaal 4 maanden. Als ze dan nu een datum afspreken, dan moet je ook echt die datum de werkzaamheden laten doen, als je dan dus niet kan, dan komen ze daarna pas weer over 4 maanden. Dit geeft dus al aan dat de vraag zo hoog is, dat de bouwkosten niet verlaagt zullen worden. Ik verwacht dat de bouwkosten gezien de toenemende vraag en beperkte bouw van de afgelopen maanden, de prijzen vooral zullen stijgen. Misschien totdat de grens is bereikt als de markt het niet meer kan betalen. Maar uiteindelijk zie je dat de markt aan elkaar hangt met "wat kan de consument betalen?" De bouw moet uiteindelijk door de consument betaald kunnen worden.</p>	Markt dwingt, benieuwt naar de prijs 2/3 van energierekening zijn belasting. Wat heb je dan aan energie besparen Investeren of mooier huis Duurzaam per saldo hoger Bouwkosten gaan alleen maar stijgen. Wat kan de consument betalen?

Dit had je dus bij de woningmarkt ook. Je kan de wel om een energielabel vragen en gaan investeren. Maar als ik dan mijn huis ga verkopen, dan haal ik de investering er niet uit. Dus duurzaamheidsinvesteringen doe je omdat je ze zelf wilde terugverdienen. En in de zin van, ik wil hier nog 10 jaar wonen, en in die 10 jaar tijden leveren mijn zonnepanelen genoeg geld op om ze terug te kunnen betalen.

Wat levert een investering op?

Het is wachten tot de energie echt niet meer te betalen is, en dan moet je wel aan de energiebesparende maatregelen. Aan de andere kant heb je natuurlijk het beeld, als ik vijf jaar geleden had geïnvesteerd in een woning van D naar B label halen. Dan had het zoveel gekost. Datzelfde kan ik nu natuurlijk veel goedkoper bereiken. Zowel in de isolatie sfeer als in de panelen sfeer en dat soort dingen hebben we natuurlijk enorme kosten verlagingen weten te creëren. Dus dat blijft weer allemaal waar; als we het nog vijf jaar uitstellen, dan komt het allemaal wel. Dan is natuurlijk ook even de vraag. Wat gaat er allemaal komen uit de regeringsplannen, met wat willen we allemaal bereiken.

Ja , er zijn meerdere richtingen, en ik ben wel echt uit de richting trias energetica en goed inpakken. Elke installatie die je erin stop heeft draaiende onderdelen, en deze kosten altijd sowieso geld en onderhoud. Dus vanuit deze optiek zeg ik altijd, eerst de schil goed inpakken, en dan de installaties minimaliseren om de benodigde energie vraag op te wekken. En dan heb je nog de opwekking nodig zegmaar.

Als energie heel duur wordt, dan moet je wel duurzamer worden

Maar dat is vooral ook meer om andere te laten zien van wat het betekend. Want dit betekend wel iets. Want op zo een pomp moet ook jouw ventilatie systeem worden aangepast. Want hij trekt eigenlijk warme ventilatielucht door een warmte wisselaar langs koude ventilatie lucht die hij van buiten trekt. Dus je moet overal kanalen maken in bestaande woningen zegmaar. Om die warme lucht naar de warmte pomp te krijgen en vanuit daar zegmaar sluit je die warmte pompt aan op die lage temperatuur verwarming. Ik heb gelukkig al vloerverwarming liggen, dat is lage temperatuur verwarming. Maar als je die niet hebt, betekend dat je alles moet aanpassen, al je radiatoren naar lage temperatuur. Dan is dit dus een extra kostenpost.

Elke installatie kost geld

En we kunnen niet zeggen wat specifiek de kosten zijn. De afgelopen weken komen er toevallig steeds mensen die het over nieuwe woningen hebben. Een grote woning. Of een grote woning willen gaan bouwen. En zij willen dan All-elektric, of energie neutraal, of nul op de meter. Maar ze weten niet precies wat. En dan gaan we naar die woningen kijken, en dan zien we dat het echt heel erg specifiek is. En dan komen ze met een budget, en gaan ze al een woning van acht ton bouwen. En ze zitten al tot de max. En dan geven ze ook nog aan dat ze energie neutraal willen. Dan zeg ik, dat kost wel geld, dit kost heel veel geld. Dat snappen ze dan al niet helemaal. Gister kwam er nog iemand die volle isolatie wilde.

Warmte pomp moet op lage temp verwarming. En dat heeft niet iedereen, dit kost geld

En ja dat is ook wel zo. 10 zonnepalen levert jou 80€ besparing op in de maand door de zon. En kost €6000,-. Zet dit weg tegen de rente van nu. Dit is dan nu even snel uitgerekend. Dit is een 10tje per maand, 120€ in het jaar. Als je het mee zou kunnen financieren. Dus €5,- in de maand aan woonlasten netto extra. Per saldo krijg je dan dus eigenlijk €75,- in de maand erbij. En dus precies wat jij zegt, die mindset, wat mensen voelen in hun portemonnee, maar het levert eigenlijk juist geld op.

Mensen willen wel energie neutraal, maar snappen de kosten niet

De nieuwe generatie wil geen eigendom meer hebben. Daar ben ik nu juist mee bezig. Het leasen van installaties. Energiezuinige woningen, modulair. Hier zit een energieschacht in. En we zijn bezig om deze te leasen. Deze woningen kunnen alsnog tegen een traditionele prijs verkocht worden, omdat je de dure installatie leaset. Dus je hebt dan geen eigendom meer. Hier zijn truckjes voor. Het is dus geen eigendom, en je hoeft ook niet bang te zijn dat hij kapot gaat. Ten tweede is je aankoop geen probleem. Je kan dus eigenlijk een grotere woning kopen als je de installaties leaset. Of je kiest voor minder woonlasten, je kan dus een keuze maken, en je risico wordt kleiner.

Meer laten zien dat het geld oplevert

Ja precies klopt. Het is ook in Schaijk, het dorpje hier verderop. Woningen met duurzaamheid waren €25.000,- duurder. Die konden ze aan de straatstenen niet kwijt. Wat je zag in Schaijk, is dat ze het concept hebben veranderd, en nu hebben ze in plaats van die €25.000,- hebben ze er gewone EPC woningen van gemaakt. Met hierbij een extra berging. Dus ze hebben die woningen weer terug geplaatst. En betaalbaar gemaakt.

Geen eigen bezit

Duurzame woningen 25.000,- duurder

Zij moeten dus investeren om deze woningen te verduurzamen. Het liefst zouden ze vanuit de huur dit terug willen financieren, een bepaalde huurverhoging dus. Als ze dit aan de huurder gaan vragen, dan zijn huurders vaak niet echt gewillig om mee te doen. Dan zeggen ze, ja dan doen wij niet mee. En de corporatie moet dus 70% van de huurders achter zich krijgen. Dus dit is altijd de weegschaal, moet hoeveel kunnen zij aan huurverhoging vragen. En dan krijg je natuurlijk de discussie, van je betaald een 10tje per maand huur meer, maar wie zegt dat die 10€ ook echt wordt bespaard?

Weegschaal, hoeveel huur kun je extra vragen

Die berekening kunnen wij dus wel maken. We kunnen uitrekenen wat de lasten op dit moment zijn, en wat de lasten zijn na de renovatie. Aan de ene kant, blijkt natuurlijk theorie, want als je een nul op de meter woning hebt, blijkt dat als je je schil zegmaar vanuit de trias energetica inpakt. En die huurder gaat vervolgens de volgende dag weer zeggen. Ik wil iets aan de muur maken en ik boor er door heen. Dat is een gigantische koude lek. En dit heeft bijv. al heel veel impact op de energievraag. Hierdoor worden bijv. prestaties niet gehaald. Hier stoeien corporaties ook mee nu. Over het feit in hoeverre zij prestaties durven af te spreken. Als er prestaties worden beloofd aan een bewoner. Dan moeten er allemaal eisen worden afgesproken over wat de huurder wel en niet mag in zijn woning.

Goed isoleren, maar hierdoor geen gaten mogen boren in de muur.

Dus dit is altijd de weegschaal, moet hoeveel kunnen zij aan huurverhoging vragen. En dan krijg je natuurlijk de discussie, van je betaald een 10tje per maand huur meer, maar wie zegt dat die 10€ ook echt wordt bespaard?

Huurverhoging

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Na renovatie eisen over wat wel en niet mag in de woning

Als je dit geregd kunt krijgen met bewoners dan mag dat zeker. In de basis, 80 besparen, en als we 50% van deze besparing doorrekenen als huurverhoging, dan gaat de huurder er toch €40,- op vooruit.

Huurder gaat er vaak wel op vooruit

Wat wij altijd zeggen, is dat je eerst altijd vanuit de vaste materialen moet werken. Dus eerst de warmte vraag beperken. En er zijn al wel voorbeelden van woningen waar je zelfs met een fohn je woning kan verwarmen omdat deze woning zo goed lucht dicht is gemaakt.

Eerst warmte vraag beperken

Dit is bij ons het uitgangspunt, het residuueel rekenen. Hierin zie je dus de kostenkant voorbij komen. En als deze kostenkant zich niet weerhoud tegen de ontwikkeling van de vrij op naam prijzen, dan zie je dat duurzaamheid dus meer kost als dat het oplevert.

Duurzaamheid kost meer dan het oplevert.

Even heel plat, in grote hoofdlijnen, zonder nuances. Om een gewone nul op de meter te maken, nieuw bouw ten opzichte van het bouwbesluit, zeggen ontwikkelaars hier, ze moeten €20.000,- a €25.000,-. In extra isolaties en installaties, en dit levert de woning maximaal €15.000,- extra op. Oftewel 5 a 10 duizend per woning vloeit er weg. Als er residuueel gerekend wordt, betaald de gemeente dus dat verschil. En dat vinden wij jammer

Gemeente betaald het verschil.

Maar ook innovatie binnen de bouw, dat wat vroeger verplicht werd. Laten we zeggen, waar binnen de bouwsector erg over geklaagd werd. Dat is nu gemeengoed, en zie je eigenlijk ook niet meer als, hogere kosten. Want door innovatie is het ook goedkoper geworden. Crisis heeft er ook enigszins toe geleid dat er ook goedkoper gebouwd werd, uhm en dat de kwaliteit er niet al te veel onder geleden heeft.

Innovatie. Lagere bouwkosten.

En er zijn zelfs tegenwoordig al bouwers die beweren dat ze duurzaam kunnen bouwen, of nul op de meter. Die niet of nauwelijks duurder zijn dan het realiseren van gewone woningen.

Duurzaambouwen. Niet duurder.

Denk hierbij bijvoorbeeld aan tochtstrip. Of desnoods aan dubbelglas, dit ook helemaal niet zo heel erg duur. En dan kun je eigenlijk met een kleine investering, een paar duizend euro. Dan kun je van label F naar label D bijvoorbeeld gaan. Als je dan uiteindelijk van je label A, naar A ++ gaan. Dan moet je echt heel erg veel gaan investeren, denk aan 10, 15, 20, of zelf 25 duizend euro. Om te zorgen dat je dan van A, naar A++ gaat.

Grote stap goedkoper dan kleine.

Het kost gewoon heel erg veel meer. En er worden al geen woningen meer gebouwd die niet BENG zijn, want jij hebt het over nieuwbouw natuurlijk. Maar er moet dus best veel en extra geïnvesteerd worden, om die A+, of nog meer plusjes te behalen ten opzichte van die standaard woning.

A+ grote investering.

Dat is natuurlijk innovatie. Die zal er voor zorgen dat er goedkoper en duurzamer gebouwd kan worden. De grootschaligheid, en hoeverre kan er gebruik gemaakt worden van, maatregelen die al genomen worden, denk aan stadsverwarming en dat soort dingen, ook al is dat ook niet altijd even duurzaam, maar dat is ook niet altijd de goedkoopste oplossing voor woningen. Maar er zijn natuurlijk andere oplossingen en innovaties te bedenken

Grootschalig duurzaam.  
Goedkoper.

Gaat het om binnen stedelijk locatie realisatie met hoogste opbrengsten per vierkante meter. Dan is het makkelijk om daar een deel van aan duurzaamheidmaatregelen te besteden. Dan wanneer het om een locatie gaat in krimp gemeente of niet al te beste plekken.

Hoge opbrengsten. Makkelijker verduurzamen.

En zo heb je ook gemeenten die wat meer gaan voor kwaliteit i.p.v. kwantiteit. Of minder geneigd is om wat kleinere meters tegen een hogere prijs te accepteren. Als hier tegenover, hoogwaardig of groot aanbod van voorzieningen staat. Binnenstedelijk, of op locaties waar de natuur, of bereikbaarheid extreem goed is. En dit bepaald natuurlijk de prijs per M<sup>2</sup> of de woningprijs.

Kwaliteit of kwantiteit.

Nu hebben we het over drie partijen. En als je door de ogen kijkt van verschillende onderzoeken, dan is het niet heel vreemd om te zeggen, dat van de €25.000,- extra investeringskosten, van dat bedrag bij de consument 1/3e van het bedrag boven op de vrij op naam prijs moeten komen. En dan 1/3e ten laste van de grondwaarde, en dan 1/3e dat moet dan de bouwende partijen maar voor haar rekenen nemen door bijv. innovaties. Maar als je met gemeenten gaat praten, die staan best open voor het voor hun rekening nemen voor een deel van de kosten. En ook consumenten staan hier best open voor. Dit blijkt ook uit onderzoeken, die staan ook open voor het voor hun rekening nemen. Ja, dan wordt de groep groter. Dus een deel is vanuit zichzelf bereidt om er iets voor te doen. En dus, ik ben er wel van overtuigt, dat bouwende en/of de realiserende partijen ook een steentje moeten bijdragen. En dus ook een deel van de kosten voor hun rekening moeten nemen. Zij zullen daar ongetwijfeld anders over denken

1/3 per partij.

Dus dat zal steeds meer gaan voldoen aan de eisen. Stichtingskosten zullen in totaal toch altijd hoger liggen dan niet BENG woningen. Maar die mogen gewoon niet meer gerealiseerd worden. Dus ja, in het begin zullen we te maken krijgen met hogere stichtingskosten. Maar of deze woningen daarom meer waard worden/zijn?

Hogere stichtingskosten.

En nu is dan aan de andere kant wel de vraag, kijkend naar het figuur wat ik getekend heb. Van de afnemende meer opbrengsten per Euro. Woningen die op dit moment gebouwd worden. Standaard woningen, zonder zonnepanelen, met een gas aansluiting. Die heeft al standaard een label A. Pin mij hier niet op vast. Maar zoiets. Wil je dan uiteindelijk gasloos, en zonnepanelen op het dak. Ga je van A naar A++, dat betekend dat wel €25.000 meer. Hoeveel ga je nog besparen op die woning. Want hij is al heel zuinig. Dus ja, dat is ook belangrijk

A naar A++. Hoge kosten.

Extra kosten voor maatregelen die A++ worden, wie moet het dan betalen. Bij deze parades paartjes doen gemeenten dat dan. Maar die €50.000,- extra stichtingskosten per woning, door de gemeente. Hadden die niet beter uitgegeven en gerealiseerd kunnen worden bij de bestaande bouw. is dit wel de meest duurzame oplossing. Een paar nieuwe woningen die nog iets minder verbruiken, of in de bestaande bouw een paar honderd woningen die veel minder gaan verbruiken.

Hoger stichtingskosten  
nieuwbouw, liever voor  
bestaande bouw

Innovatie is belangrijk, de mate waarin je kunt aanhaken op bestaande, duurzame infrastructuur, schaalverdeling. En ja, in hoeverre een locatie, de kwaliteit van een locatie, die mede bepalend is voor grond prijzen. En daarnaast natuurlijk, de overheid, het beleid. Niet alleen dwingend, maar er moeten maatregelen genomen worden, maar vanuit zakelijke kant. Wat betekend het voor de energie belasting. Gaat er belasting worden geheven op zonnepanelen. Salderen. Hoe ontwikkeld het gas of de elektra prijs zich, en wat doe uiteindelijk de belasting op gas en energie.

Innovatie. Locatie. Beleid

die hele installatie met warmte pomp, en boiler, en zonnepanelen. En elke woning hier heeft zijn individuele bron. Tussen de 80 en de 120 meter diep, afhankelijk van het plekje in de wijk. Dat hebben we met geotechnisch onderzoek moeten uitzoeken, of dat ook kon. Dat was allemaal prima, toestemming gekregen van de provincie. Maar die hele installatie kostte, even voorzichtig ingeschat, ongeveer 18 duizend euro.

Gehele installatie. 18K.

Die investering, die moet je natuurlijk terug verdienen, en eigenlijk is het qua bouwkosten natuurlijk €18.000,- duurder geworden dan een woning met traditioneel een cv. ketel. Dus wat zeiden wij tegen makelaars, die woning is €18.000,- meer waard. Nee hoor, vonden die makelaars niet.

Makelaar. Geen meerwaarde.

De kosten worden lager van de technologie en op grotere schaal toegepast. 18 duizend is allang geen 18 duizend meer voor een installatie.

Kosten worden op lange termijn lager

De bouw is weinig innovatief. Woningen nu worden op dezelfde manier gebouwd als in 1970.

Bouwers prijzen zichzelf straks uit de markt als ze niet meegaan in de innovatie. Je moet koploper zijn zorgen voor tevreden recencies. Net als op lens bijvoorbeeld

Kosten zullen de laatste tijd niet dalen vanwege de marktwerking. Erg veel vraag naar nieuwe woningen en materialen.

Verwachten kosten om een woningen te laten voldoen kan oplopen tot 30.000,-

Bij Rijwoningen moet BENG wel goed komen. Daar valt het nog wel mee. Maar bij 2 kappers en zeker vrijstaande woningen. Daar is het lastig om aan BENG te voldoen. Ook juist door de huidige technieken.

Dat zal ik voor je opzoeken. Maar dat heeft te maken met huur en met koop. Ik schat iets van €25.000,- Maar ze moeten de installatie dan kopen, en niet huren. En nog wat andere voorwaarden. Zodat zij die EPC vergoeding kunnen inzetten. Dus het is niet zo dat nul op de meter..we moeten aanvullende berekeningen enzovoort aanleveren, en bewijslast, zodat die woning ook echt voldoet.

Weinig innovatie

Recencies, net als op IENS

Kosten gaan niet dalen

Kan oplopen BENG tot 30.000

Rijwoningen geen probleem.  
2kapper en vrijstaand wel

25.000 extra kosten

Sommige woningen zijn zelf meer waard nu. En ja, dan heb ik het wel echt over rijtjes huizen. En niet het duurdere segment. Dat hoopten wij wel, maar op dit moment zie je, dat de plek wel heel erg belangrijk is. En dan merk je wel dat het geen Delft. En je ziet nu dat bestaande woningen verkocht worden tegen de €3000,- per m<sup>2</sup> aan. Dus er is in Rijswijk buiten een stijging te zien. Maar dat komt door het volume dat je hier hebt, en de ambassadeurs in de wijk, die eigenlijk ervoor zorgen dat, de wijk heel erg populair wordt. Je zit hier vlakbij Delft en Den Haag. Dus het zijn Randstedelingen die hier mee bezig zijn. Bijvoorbeeld in een dorpje. Dus, hoe kun je dit dan waarderen, dat is in het begin, dan kun je het niet waarderen. En op gegeven moment heb je voldoende data opgebouwd. Waardoor je het dan wel kunt waarderen.

Rijtjes woningen wel wat meer waard, vrijstaand niet.

Duurzaamheid is over 10 jaar beter vermarktaar.

Bestaande rijtjes woningen verkocht voor 3000,- p m<sup>2</sup>  
Over 10 jaar is duurzaamheid beter vermarktaar.

## Markt

### Bron

### Tekst

### Open codering

De koopwoningmarkt, voor steeds meer starters onbereikbaar wordt door de hypotheek rente die ze hebben, en de eigen middelen die ze mee moeten brengen ten opzichte van de toch wel flink gestegen woningprijs. En als hier dan bovenop nog de duurzaamheidsinvesteringen moeten komen, dan is dit voor de starter al helemaal niet meer te doen.

Starters markt wordt onbereikbaar

Gasloos: Dat weet ik niet. Ik denk dat een systeem met 26/27 woningen die allemaal aan 1 warmte systeem hangen niet perse voor de bouwer duurder is. 22x maal een woning met een ketel kan een flinke warmtepomp opleveren. Ik heb hier dus geen inzicht in, maar betwijfel of het dus wel zoveel duurder is dan op een andere wijze bouwen

Gasloos hoeft niet duurder te zijn

Je zit ook in de markt, de consument laat zich niet leiden, door wel of niet extreme duurzaamheid voorzieningen. Die laat zich leiden door de aantrekkelijkheid en de aanwezigheid van comfort. En ja, vloerverwarming vind men horen tot comfort. En behoort deze tot duurzaamheidsvoorzieningen dat je LTV verwarming hebt, dat maakt de consument niet veel uit.

Consument laat zich niet leiden

Er zijn maar weinig mensen die echt uit milieu aspect kiezen voor duurzaamheidsvoorzieningen. De aantrekkelijkheid ligt echt vooral bij hoe leuk de woning is, en wat hij biedt en hoe mooi vind ik hem.

Weinig mensen die echt uit milieu aspect kiezen

Maar de markt moet het ons uiteindelijk leren wat de consument kan betalen, financieren en aan eigen middelen hebben. Maar als de markt ook blijft vinden dat we minder kunnen financieren dan de marktwaarde zoals de banken nu doen. Als zij vinden dat de consument meer eigen middelen mee moet nemen. Dan weet ik niet of de markt dat wel aan kan.

Markt moet ons leren wat de markt moet betalen

Ik verwacht dat prijs qua bouwen zou stijgen, maar niet in die mate die bouwers voorspiegelen. Want ook daar bestaat weleens de indruk dat de werkelijkheid en wat zij pretenderen, niet helemaal overeenkomt met elkaar

Prijs qua bouwen stijgen

Ik verwacht dat prijs qua bouwen zou stijgen, maar niet in die mate die bouwers voorspiegelen. Want ook daar bestaat weleens de indruk dat de werkelijkheid en wat zij pretenderen, niet helemaal overeenkomt met elkaar. Maar het speelt wel een grote rol.

Prijs qua bouwen stijgen

Nee precies! Dan jongens, kun je dit soorten marktwerkingen verzinnen? Nee, dus via een marktanalyse kom je hier achter. De volgende vraag is, of het verschil groot genoeg is om te zeggen, het is zodanig significant dat ik het in mijn taxatiemodel kan zetten. Op gegeven moment is dat dus wel zo.

Marktwerking kun je niet verzinnen

Er kunnen dus in de markt dingen gebeuren die je normaal niet verwacht. Er gaan dus ook bij duurzaamheidsaspecten dingen spelen. Op het moment dat je zegt, jongens, er worden bepaalde maatregelen bedacht. En dan kijken we, hoe gaan mensen nu reageren op dat soort maatregelen. Gaan ze reageren, door te investeren, waardoor woningen met slechte labels gaan afnemen. Of gaan ze juist zeggen, jongens, dat er meer druk komt op die andere, dat er niet meer woningen bij komen in de betere categorie, maar dat ze juist heel sterk in de markt gaan stijgen. Dus dat zijn dingen waar je op moet gaan letten. Maar je kan denk ik niet van te voren voorspellen hoe precies de markt gaat reageren.

Marktwerking

En de marktwerking heeft in dat opzicht een soort zwaartekracht. Je kan er niets aan doen. Maar je moet er juist gebruik van maken.

Marktwerking als zwaartekracht

Je moet dit duidelijk wel gaan nuanceren. Van jongens, ja met alleen maar marktwerking gaan we geen doelstellingen van 2030 / 2050 halen. Hier moet je dus inderdaad gericht andere maatregelen doen, die dan door de marktwerking weer gaan bijdragen. Maar alleen op marktwerking gaat het niet komen. Er zijn te weinig mensen die zeggen we gaan het zelf doen qua duurzaamheidsaspecten

Doelstelling 2030/2050 niet halen met deze marktwerking

Nou op diezelfde manier kan je dus als gemeente ook zeggen. Ik wil hier een duurzame wijk creëren. En om duurzaamheidsinvesteringen te stimuleren, bied ik de kavels 20% goedkoper aan. Onder de voorwaarden dat je er minimaal energie neutrale woningen op neer gaat zetten. Maar dan ga je natuurlijk weer over beleid praten, en niet over de markt. Dat is prima! Maar je moet het niet gaan verwarren met elkaar.

Kavels goedkoper aanbieden ter stimuleren

Als ik het aanbied voor de normale grondprijs die je eruit moet halen, want de gemeente moet ook zijn investering eruit halen. Eh en dat soort dingen. En ik heb de bouwkosten incl. de duurzaamheidsmaatregelen, komt er dan een prijs uit die we met elkaar wel kunnen betalen? En dan kom je weer bij de markt uit. En dan markt geeft aan dat de gemiddelde Nederlander gemiddeld niet meer dan €250.000,- voor zijn woning betalen. Want ja, zijn salaris is nou eenmaal niet hoger. Dus ja, dat bepaald op gegeven moment dan wel weer het plafond. Want we kunnen wel zeggen van jongens, we kunnen dat allemaal wel doen. En hop het niveau dat we zitten, dan kost een woning 4 ton. Ja, dat is mooi, maar dat kunnen we in Nederland lang niet allemaal betalen

Markt geeft aan dat men nog niet wil betalen.

Maar toch. Als je een investeringsbeslissing neemt. Dan is 40 jaar vooruit kijken toch gewoon onoverzienbaar. Je moet je ook realiseren dat in 2050 de woningen waarin wij wonen, het grootste gedeelte staat er nu al. Dus dan ben je dus alleen maar met verbouwingen en veranderingen bezig. En die nieuwbouwopgave gebeurd ook, daar kun je van alles mee doen. Dat kan het probleem opllossen. Maar niet allemaal tot 2050, en wonen in een nieuwe woning die na 2030 gebouwd is. Zo werkt het niet.

Grootste deel woningen staan er al

Begin jaren 50, begin jaren 60. Die woningen zijn niet heel karakteristiek en niet heel duurzaam gebouwd in de zin van, bedoeld om lang mee te gaan. En slopen en vervangen voor woningen die in het ontwerp al echt bedoelt zijn voor, dat kan ik me voorstellen. Maar jaren 20, jaren dat woningen gaan heel weinig gesloopt worden. En ook voor deze woningen aanpassen komen steeds meer oplossingen voor.

Jaren 20 gaat niet gesloopt worden

Nou, als dus inderdaad, ik heb er een paar op mijn kap, en 2 identieke woningen. En deze leveren mij zeg maar 100 / 80€ maand op. Voor 10 panelen. Dus zeg ff €6000 kosten. Dat is 1000€ in het jaar wat het mij oplevert. Gemiddeld woont er iemand 7 jaar. Dus dan heb ik het al terug verdient. Daar bij komt, op het moment dat ik deze woning ga verkopen, kan ik in principe deze rekensom in de verkoop erbij zetten. Dus als deze woning tegelijk wordt verkocht, voor bijv. €300.000,-. En op die van mij liggen zonnepanelen, dan weet ik zeker dat ik die van mij eerder kwijt ben.

Terugverdientijd

Ja, ik weet niet hoeverre makelaars en taxateurs hier een zicht op hebben, in de gemiddelde woonlasten van een wijk of straat of specifiek huisnummer. En dan zou je dus inderdaad als er een besparing zou zijn, zou je dit aan de andere kant er tegenover kunnen zetten. En dus zegen van, inderdaad, deze woning is duurzaam. En het gemiddelde is hier in woonlasten 180€ in de maand. En als je de energierekeningen hebt van deze mensen, dan ze je wat je kan besparen. En dat is er nu dus bijna niet

Woonlasten vs besparing

De markt, ja, mensen zijn niet meer, dat valt me ook wel op he. Als ik dan tussen de steden door rij. Dan zie je dat op het platteland veel woningen te koop staan. Dat is in het verlengde van wat jij zegt, mensen willen flexibeler zijn, dichtbij waar alles gebeurd. Dus verstedelijking zie je zeker plaatsvinden. Het flexibel wonen. Niet zo ver van de bewoonde wereld af.

Flexibel wonen

Misschien dat het zelfs zonder huurverhoging gaat gebeuren, en dan schrijven ze het onder onderhoudt. En je ziet dan ook steeds meer wijken waar corporatie woningen er beter bij staan dan de koopwoningen in deze wijk. En de particuliere markt wil de portemonnee er nog niet voor trekken.

Zonder huurverhoging, schrijven onder onderhoud

Ik denk dat juiste richtingen zijn om bijvoorbeeld de gasprijzen omhoog te gooien. Ik zal verder niet echt weten hoe je iemand kan verplichten om zijn woning minder CO2 uitstoot te laten produceren.

Wat wij merken op bijeenkomsten op particuliere markt, is dat mensen niet eens voor een advies willen betalen.

Gasprijzen omhoog  
Mensen willen niet eens betalen voor duurzaam advies

Gasprijzen omhoog. Subsidies omhoog. Het is linksom of rechtsom. En subsidies werken wel. Er zijn nu al meer zonnepanelen in Nederland door de subsidies. Dus het werkt wel. Energieprijzen gaan komende tijd heel erg stijgen, waardoor iemand met een bestaande woning wel iets moet gaan doen. Dit lijkt mij de oplossing.

Zeker! En ook ziet de woning er vaak beter uit. Een woning die naar A label wordt gerenoveerd. Deze heeft vaak een nieuwe gevel, nieuwe pannen. Nieuwe isolatie. En dat ziet er opeens anders uit.

Subsidies werken  
Label A betekent ook betere kwaliteit

. Want daar hebben ze die energie prestatie voering voor in het leven gebracht. Dat was een heel politiek traject. Hier is de wetgeving voor aangepast. Deze is voortgekomen uit stroomversnelling / nul op de meter energie prestatie voering. Een energie rekening van €100,- of €150,- boven op de huur kunnen zetten. En ook schiet je hier boven die €710,- dat is de grens. Om daar bovenuit te kunnen komen, met zo een EPV, dan is wel een voorwaarde dat de energetische prestaties gegarandeerd zijn, en jaarlijks gemeten gaan worden.

Garanderen. Energie besparing.

Je hebt nu al de labels, A++ t/m G zegmaar. En als ik niets doe, heb ik ook G, mits ik aan kan tonen dat. Dus dat je in je verkoop brochure groot moet aan moeten geven wat het label is, en het bij deze label behorende gemiddelde verbruik neerzetten. Gemiddeld gebruik van een gezin bijvoorbeeld. Dan weet iemand wel gelijk van, oke. Dan kan hij het rijtje woningen bekijken. En je ziet dan, de woningen hebben dezelfde waarde alleen bij de ene woning zal gemiddeld minder energie betalen dan de andere woning. En dus heeft die woning eigenlijk een andere waarde. Dus op die manier denk ik, dat het echt belangrijk is, om in € te gaan uitdrukken wat die duurzaamheid is. Je mag er best €40,- naast zitten.

In kaarten brengen besparing.  
Brochure.

Een ander effect kan juist zijn, dat de starter bestaande woningen koopt. En zelf enorm gaat isoleren. Met eigen handen, gefaseerd, elke keer als er geld is. En misschien is dat wel juist wat we nodig hebben om die bestaande voorraad vernieuwd te krijgen op energie gebied. Misschien komt dit dan juist vanuit de starters, wel meer dan iemand die al een wooncarrière achter zich heeft en doe heeft geen zin om alles aan zo een woningen te gaan verbouwen. Ja, en misschien gaat de starter wel juist zijn gedrag aanpassen. Door gewoon minder energie te gaan gebruiken.

Starter. Bestaande goedkopere voorraad verduurzamen.

Sommige vinden een woning aantrekkelijker met zonnepanelen, omdat dit duurzaam lijkt. Sommige mensen vinden dit sexy, zonnepanelen op je dak. En die hebben daar dan ook het geld voor. Hernieuwbare materialen etc.

Subjectiviteit. Uitstraling.

Wij kijken veelal naar, wat zijn de behoeften, wat zijn de wensen, hoe ontwikkelen deze zich? Ik merk aan de ene kant dat, ik moet eigenlijk zeggen dat ik vanuit de marktkant en de vraag kant, nog niet heel veel merk dat er specifiek wordt gevraagd

Weinig vraag naar duurzaamheid.  
Groeiende niche markten.

Wel een niche markt die steeds groter wordt en samenhangt met bijvoorbeeld zelfbouw. De tiny houses, of compact wonen.

Vraag. Energiebesparing.

Als het belangrijk is, ja dan hangt het vooral samen met energielasten, wat dat betreft is het besparen van kosten.

Vraag. Vooral overheid.

Vanuit mijn functie, wat ik dan veelal tegenkom is meer vanuit de overheidskant, of de bouwers die er over beginnen, voornamelijk vanwege de opgelegde richtlijnen vanuit de overheid. Gemeentelijke of nationale richtlijnen. Denk hierbij aan de BENG normen, bijna energie neutrale gebouwen, EPC normen die strenger worden. Vanuit deze zaken leeft het dus wel, maar vooral de vraag vanuit de overheid en de realisatie kant. Wij geven verder ook advies over grondprijzen.

Ik, of wij zijn er in ieder geval wel van overtuigt dat een deel, hea, is de consument bereid om te betalen hiervan. Omdat hij, het of de idee bereikt is om een investering te plegen voor het milieu, de maatschappij. En dit is nu een klein groepje. Als daar duidelijk gecommuniceerd wordt aan hen over wat het oplevert voor hen, financieel aan besparing, energiekosten, denk dus niet alleen aan hypotheeklasten en huur, maar ook woonlasten totaal. Als hier een duidelijke terug verdientijd tegenoverstaat, als deze tijd korter is, dus zal men meer geneigd zijn dit te doen, en naar mate deze tijd langer is, dan wordt het wat onzekerder.

WTP. Terug verdientijd

Op dit moment nog niet. Maar op het moment dat bijvoorbeeld nieuwbouw, projecten, specifiek in de markt wordt gezet als groen project. Waarbij heel sterk de juiste marketing aangesproken kan worden. Dan zou je een plus aan, het duurzame aspect van het project kunnen geven. En dan, ja, moet dat dus wel heel erg goed in de markt gezet worden, en specifiek daarop ingezet worden

Marketing. Voordelen.

En deels ook zelfs banken, naja, omdat zij dus de hypothek normen bij duurzame woningen, ervoor zorgen de prijs die de consumenten kunnen betalen. Dat die hogere ligt, en dan is natuurlijk ook de vraag. Willen consumenten een hechtere prijs betalen. En kunnen zij dat. Kun je een hogere hypothek krijgen, of wil je wel een hogere hypothek krijgen

Hypotheek voor hogere stichtingskosten

bejaarden, de 65+, die verhuizen veel minder. Terwijl de noodzaak misschien wel hoog is. Ze worden minder goed ter been, locatie van de woningen zelf is misschien al minder geschikt. Maar deze mensen zijn al veel minder goed te bewegen om te verhuizen, en vaak verhuizen ze pas als ze bijvoorbeeld hun been hebben gebroken. Een klein deel van die doelgroep is, denk er verstandig over na, over ze moeten verhuizen of niet. En achter blijkt vaak, dat het woongemak, en woongemaakt, zo veel beter is, dat ze hier spijt van hebben. Je zou hier ook iets vaker op moeten inspelen binnen marketing.

Verhuizen. Marketing. Woongemak

Hoe woningen van het gas. Ik weet het niet. Dit moeten ze aan de markt overlaten. Die kan het veel en veel beter. Hier zal wel een dwang op moeten worden gezet, en ze zullen het proces hier en daar wel moeten faciliteren. En ook wel wat subsidiëren, energie belastingen. Maar ze moeten het vooral niet zelf gaan doen

Marktwerking. Met hulp.

Ja dat is tot de dag van vandaag zo. Inmiddels verkoopt deze wijk zichzelf, dus dat is geen issue meer. Maar zoiets is wel een dingetje geweest. Dus toen hebben we die verhuur constructie bedacht. We gaan het in een exploitatie maatschappij stoppen. En dan drukt dit dus helemaal niet op de stichtingskosten van een woning. En kunnen..of moeten de mensen die installatie gaan huren.

Wijk verkoopt zich vanzelf

Wij hebben laten zien dat je zonder subsidie ook hogere inmenging van de overheid voor elkaar kan krijgen. Gemeenten lopen hier de deur plat om te kijken hoe wij dat hebben gedaan.

Zonder subsidie inmenging overheid

Mensen moeten worden beloont worden in plaats van gestraft.

Belonen ipv straffen

## Grondprijzen

Bron	Tekst	Open codering
	<p>Maar als het voor de gemiddelde consument het duurder bouwen en stijgende grondprijs het uiteindelijk dus geen haalbare kaart wordt, ja dan moet om het haalbaar te maken, het toch ergens terugkomen. En dat zal dan toch uiteindelijk in grondprijs moeten zijn denk ik. Want als er enerzijds wordt gedwongen om duurzaam te bouwen en de bouwkosten stijgen, en grondprijzen worden niet gesubsidieerd of aangepast, dan zijn de woningen dus uiteindelijk niet betaalbaar voor de markt, en worden de woningen dus niet meer verkocht. Dan zal je dus een keuze moeten maken.</p> <p>Als ik een tussenwoning wil, en ik kan maximaal €200.000,- financieren. En de duurzame tussenwoning zou €240.000 moeten kosten. Dan kun je hoog en laag springen, maar dan ben je snel klaar.</p> <p>Ja, misschien moet standaard de grondprijzen wel omlaag. Waardoor de woningen duurzaam gemaakt kunnen worden. Dit is natuurlijk ver in de toekomst kijken, en kom je snel op het vraag en aanbod deel. Waar behoefte aan is. En vanuit de markt moet er dan onderzocht worden. Wil je dat startende mensen op de woningmarkt naar een andere gemeente gaan omdat ze daar wel een korting toepassen. En de grondprijzen daar lager houden en in de zelfde woning kunnen wonen, en niet in Den Bosch. Je ziet dus een verschuiving dan.</p>	Haalbaar maken Niet kunnen financieren Standaard grondprijzen omlaag

Nou ,de bouwer gaat dit echt niet betalen. Die zijn hier niet zo happig op. Dus het zou bij de gemeente of de koper komen te liggen. En nou, de koper, die komt bij de bank en die wil het financieren. Ja, omdat de banken nu niet bereidt zijn om te gaan financieren. Dat is nog niet geregeld. Dus je hebt de banken, aannemer, koper en gemeente. En dan blijft dus misschien wel de gemeente als laatste over. Dus ja, ik ben benieuwd, Ik zie grondprijzen niet echt dalen nu.

Bouwer gaat niet betalen

Wat ik op dit moment zie, als je residueel rekent, dit nog niet afgeprijsd wordt via die v.o.n. prijs want die gaat nog steeds zoveel vierkante meter voor de woning en de omgeving en dat is dan dit. En ja Gloudemans moet dit allemaal kunnen vertellen. Terwijl je zou kunnen zeggen, dat ook die vrij op naam prijs beïnvloed wordt door het extra comfort. Dus die vierkante meter met dat comfort niveau zou meer waard moeten zijn. En daar zit volgens mij nu nog wel die zoektocht naar waardering. Waardoor het nu af gaat van de grondprijs. Het kost zoveel om die installatie aan te brengen, en per vierkante meter levert de woning niets meer op. Er is 1 partij de klos, en dat is de grondeigenaar.

Comfort. Stichtingskosten.  
Grondeigenaar.

Gem. Tilburg: Maar ik zie best wel gebeuren dat wij residueel, met iets lagere grondprijzen genoegen gaan nemen. Om hiermee hogere duurzaamheids ambities mogelijk te maken. En ja, eigenlijk betalen wij dan dus mee. En dit vroeg jij toch? Maar dit doen wij dus door te accepteren dat er dus wat minder grond inkomsten komen, en hoger duurzaamheids ambities te realiseren.

Duurzaamheids ambities. Lagere grondprijzen.

Ik denk wel dat wij hier geen beleid van gaan maken. Omdat je daarmee niet uitlokt tot optimalisatie. Als wij nu zeggen, wij gaan zoveel procent verlagen bij hogere energieprestaties, dan gaat iedereen rustig aan doen. Dus je moet rustig aan denken ze dan. Dus ga vooral belonen wie een scherpe koers vaart, dat je zegt van oké, daar zijn wij bereidt een bijdrage te doen. Wat wij hebben in principe afnemende normen waar iedereen zich aan moet houden. Denk hierbij aan BENG, of later nul op de meter, of energie opleverende woningen zelfs.

Beleid = niet uitlokken tot optimalisatie

Mensen kunnen geen huis kopen door hogere stichtingskosten. -> Dan moeten ze naar de financieringshoek. En naar de triodosbank

Dus ja, uiteindelijk, innovatie leidde er toe dat er ook goedkoper en duurzamer gebouwd kan worden. Dus zeker met de stijging van de woningprijzen op dit moment, en op dit moment zijn de kosten, de stichtingskosten voor het extra duurzaam bouwen, zijn dermate hoog. Dat dit nog zeker een drukkend effect heeft op de grondwaarde, residueel gezien. Door de stijging van verkoopprijzen, is er nog steeds een plus op grondwaarde te behalen vinden wij.

Kosten nu hoog. Drukt op de grondwaarde. (stijgende huizenprijzen leiden nu tot een plus op de grondwaarde)

Dit betekend dat alles wat je doet, de verkoopwaarde van een woning probeert te beïnvloeden. En als het daarnaast ook nog invloed heeft op de stichtingskosten, hoge of lage stichtingskosten. Dan heeft het effect op de residuele grondwaarde. Dus ja, zo zijn wij er ook mee bezig.

Verkoopwaarde. Invloed op grondprijs.

Nou kijk wij gaan uit van de residuele methode. Wij vinden dan, A, dat de gemeente vanuit het privaat gerechtelijke taak moet functioneren. Op het moment dat zij grond verkopen doen zij dat niet uit hun publieke taak, maar privaat rechtelijke taak. Dus moeten ze marktconform acteren. En dus moeten ze een marktprijs vragen voor deze grond. Dus ze mogen geen staatssteun geven. En een te hoge prijs zullen marktpartijen niet accepteren. Ze moeten dus marktconforme prijzen accepteren.

Marktconform acteren.

Wat moet gemeente doen met grondprijs? Dan is het aan de ene kant natuurlijk, in hoeverre wil een gemeente vanuit haar beleidsfunctie dat er bepaalde doelen gerealiseerd worden. Maar ze moeten heel erg waken dat er dan geen staatssteun wordt gegeven.

Doelen. Geen staatsteun geven.  
Verlaging had niets te maken met duurzaamheid maar met verkoopbevordering

Destijds grondprijzen verlaagd. Had niets met EPC te maken, maar met een verkoopbevorderende maatregel.

Andere manier grondprijs berekenen

E moet op een hele andere manier worden omgegaan met grondprijzen en de berekeningen. In de residuele berekening moeten veel meer aspecten worden meegenomen zoals de besparing van energie. Maar ook aspecten zoals materialen die langer mee gaan.

Kijk hoe wij zijn begonnen. Dit is de normale financiering: 100%. Ongeveer, dat verwisseld wel eens. traditioneel is 55% onderdeel bouwkosten. 18% bijkomende kosten en marge, en dan houden we 27% over voor de grond. En dat kan wel eens wisselen. Dat kan ook hoger zijn en lager zijn. Maar dit even als rekenvoorbeeld. Dat heb je zegmaar, als je volgens bouwbesluit werkt, dan heb je volgens een woningbouwsysteem. PCS in ons geval. Maar dat kan elk willekeurig woningbouwsysteem zijn. Dan kunnen die bouwkosten ietsjes lager worden. Dan heb je iets minder bijkomende kosten, en dus meer geld over voor de GREX (grond). Op het moment dat je dus. Nul op de meter huis gaat bouwen, dan gaat dit niet meer op. Je moet naar EPC 0. En die maatregelen kun je zeker in het begin nog niet in de VOP terug verdienen

Dus wat hebben wij bedacht. Die bouwkosten zijn gelijk. Bijkomende kosten zijn ook gelijk. En eigenlijk zou je minimaal dit willen hebben in de grond exploitatie wat je normaal traditioneel kwijt bent. De 27%. Dan hou je dus geld over op het budget voor die energie voorziening. Dat is nog niet genoeg. De rest los je op door samenwerking met energie maatschappijen. Zoals klimaatgarant. En eventueel hypothek verstrekkers. Zodat je goede interessante financiële arrangementen kan regelen voor de mensen. Zoals hoe duurzamer, hoe lager de rente. En dat zijn dan geen tijdelijke project kortingen. Maar gewoon structureel. Waardoor je ruimte creëert voor je energiekosten. Door je woningbouw concept.

Financierin gronden in  
RijswijkBuiten

Schaalvolume zo groot is dat je hier gewoon wel mee uitkomt. En dat je gewoon op Nul eindigt, en dat die grondwaarde best wel hoog gaan worden voor de gemeente. Mensen zijn bereid om te gaan betalen voor energie. En dat het plaatje dan meer die kan opschuift. Dat normale grondwaarde in de grondexploitatie gaat zitten

Bouwkosten gelijk

Schaalvolume moet groot zijn

Ja maar dat klopt wel!! Let op! dit zijn geen BENG woningen! Nu profiteren we nog van de pre-BENG tijdperk. Dus je ziet na de beginfase waar je extra moet investeren. Nu pluk je de vruchten. Maar straks gaan we naar BENG, en dan zien we ook weer in relatie tot de conjuctuur, dat we op dit moment het weer een verkeerde kant opgaat. Je ziet nu dus alweer wat moeilijkheden in grondwaarde. En ja, dat gaat met BENG en wegvalen van de stimuleringsmaatregelen alleen maar erger worden. Dus dat ik ook wel iets waar wij het met de gemeente over hebben. Van joh, let goed op. En reken je nu niet rijk! want nu mag je vruchten plukken, Maar straks over 2 jaar ,dan weet je het niet.

BENG betekend meer investeren

Juist! Eigenlijk willen wij een gemixte wijk, maar je ziet nu dat er redelijk een eenzijdig aanbod ontstaat, en dat kun je voorkomen door bijvoorbeeld te spelen met die grondwaarde. En je dan een gemixt aanbod kan blijven maken.

Spelen met grondwaarde om  
gemixt mogelijk te maken

#### **Appendices 4: Interview transcriptions**

Because some interview respondent preferred to remain anonymous, the written interviews are only available on request.