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Suitable real estate valuation techniques for new residential houses in ecological neighbourhoods.

MSc Facility- and Real Estate Management (MFREM)

Master Thesis

Yvonne Schuijt

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University
of Applied
Sciences

SAXION



UNIVERSITY
of
GREENWICH

Colophon

Miss Y.C. Schuijt

Student number University of Greenwich: 001006010

Student number Saxion: 446570

E-mail: 446570@student.saxion.nl

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Tutors: Dr. A. Eros (Mrs.)

E-mail: a.eros@saxion.nl

Mr. J. Brands, MBA

E-mail: john@goalmanagement.nl

j.a.w.j.m.brands@saxion.nl

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University of Applied Sciences Saxion
Handelskade 75
7414 DH DEVENTER

and

Greenwich University
Old Royal Naval College
Park Row 30
SE10 9LS LONDON, United Kingdom

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Yvonne C. Schuijt

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Selected transcripts with tutors:

Transcripts meetings Associate Prof. Mr. J. Portilla (2 parts)
 Transcript Interview Prof. Dr. Ir. Mrs. A. van Hal
 Transcript Interview Ir. RMT. Mrs. C. Brouwer

Selected transcripts with stakeholders related to valuation techniques:

Transcript 1 Interview Mr. M. Jellema
 Transcript 2 Interview Mr. T. van Hillo
 Transcript 3 Interview Mr. M. Koopmans
 Transcript 4 Interview Mr. R. Boesveld
 Transcript 5 Interview Mr. J. Bleijenberg
 Transcript 6 Interview Mr. M. Muller
 Transcript 7 Interview Mr. R. Pijnenborgh
 Transcript 8 Interview Mr. A. Bilderbeek

Title

Suitable real estate valuation techniques for new residential houses in ecological neighbourhoods.

Summary

Purpose

For this research that **specific purpose** is finding ecological neighbourhoods and real estate agents who value residential properties in these specific locations. Determining **financing valuation** with suitable valuation techniques for new residential houses in ecological neighbourhoods, formulating recommendations of which current valuation technique is most suitable.

Design, methodology, and approach

This study is based on a **case study** as type of a **qualitative research**. Data for this research were obtained from literature research and interviews with **experts related to valuation techniques**. According to Baker and Edwards (2012), a sample of interviews consists of a **minimum of 12 interviews** for valid research.

Findings

On the basis of the results of this **completely objective research**, it can be concluded that applying suitable valuation techniques and investing in new residential houses in ecological neighbourhoods is recommended according to the Royal Institution of Chartered Surveyors (RICS, 2019). Determining financing valuation by applying the most flexible valuation technique combined with latest novelties like a **digital tool**, **green accounting** and **block chain** by **quantitative comparative approach** (Yeh and Hsu, 2018).

Research limitations and implications

The sample size is relatively small, based only on **stakeholders with expertise on valuation** of 4 selected ecological neighbourhoods, and **new knowledge of developments on sustainability** within the real estate industry (Portilla, 2019). This is typical to case studies. To improve the **reliability** of the research, the interviews are recorded and transcribed.

Originality and value

Adding value by real estate with **sustainability** in new residential houses of ecological neighbourhoods is a hot topic and trend within the fields of Facility and Real Estate Management (FREM) explained by Jensen and Van der Voordt (2017). Many researchers are engaged in real estate research with regard to **urban planning** and sustainability, building new residential houses in ecological neighbourhoods (RICS, 2019). This focus is relatively new and therefore has **added value**, especially for the **strategy** of the **Real Estate Industry** (Portilla, 2019).

Word count

19.995 words including title page, dedication, foreword, summary, index, overview figures and tables.

Foreword

This report is the final result of the MFREM-program at the Hospitality Business School of Saxion University of Applied Sciences.

Submitting this Master Thesis will end a comprehensive process that I have not been able to do this without excellent support. For this, I would like to **thank several people**.

First of all, I would like to thank Ervarings Certificaat Centrum (EVC) Nederland at Utrecht, Mister B. F. Bult and Mrs. J. Zand Scholten for convincing me to aim for a master degree. Without this process with the certificate, I would never have contacted Saxion MFREM and I never had begun. During the course, I had setbacks in my personal private environment. The support of Saxion MFREM, especially Mrs. S. Koopman – Bijvank, for her excellent guidance, enthusiasm, support, patience and expertise during this process and Thesis Support of Saxion Library service Deventer, has enabled me to stay focused. For this, I am very grateful.

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Most grateful I am to my own family for trusting and encouraging me.

I confirm that the work for this Master Thesis is **original, completely objective** and was solely undertaken by myself. Not any help was provided from other sources as those allowed. All sections of the Master Thesis that use quotes or describe an argument or concept developed by another author have been referenced, including all secondary literature used to show that this has been adopted to support my Master Thesis.

1 Introduction

Global warming is a major issue worldwide. Almost half of all the energy utilisation and discharge of carbon dioxide (CO₂) comes from real estate. Therefore, it is a major challenge for the real estate industry to build sustainable smart urban residential properties to tackle this problem (Van Hal, 2016). Several good technical solutions are already on the market, however, when limited to a single residential unit, the influence on the global **climate change** is very limited. The impact may be strengthened by an **integrated approach**, considering not only single buildings, but groups of buildings, areas. This approach also allows for the use of green technology that is related to, but is not part of a specific building, creating **future proof urban planning, innovation in the construction sector**, minimum of waste and minimisation and re-use of raw materials, by a new way of thinking in the construction sector, with **new businessmodels**.

Cities are like organisms, sucking in resources and emitting wastes. The larger and more complex they become, the greater the necessity of infrastructures and the greater their dependence on surrounding areas and last but not least, the greater their vulnerability to change around them (Van Timmeren, 2008). With recent and coming perturbations of the weather due to climate change, as well as constantly increasing global demand for energy, water, and materials, this aspect of vulnerability and dependence is becoming essential for **sustainability** (De Bruijn, 2018). Therefore, a renewed look on “the urban metabolism” is necessary (Van Timmeren, 2008). **Urban metabolism** is seen as a basis for integration strategies, organisation and realisation of sustainability in urban areas by introducing new residential houses in ecological neighbourhoods (Van Timmeren, 2008). According to Van Hal (2016), the definition of ecological neighbourhoods is “a residential area, developed by integrated urban planning, regarding ecological, sustainable, social and technical aspects, which are built in line with national sustainable policy measures” (p.12).

To decrease energy utilisation and discharge of carbon dioxide (CO₂), ecological neighbourhoods have been developed. Ecological neighbourhoods contribute to reducing costs, energy savings, improve comfort, satisfaction, social cohesion and increase wellbeing. In the **new residential houses of ecological neighbourhoods**, sustainable applications such as energy saving, heat production, integrated landscape design, water retention, and re-use have been used. These sustainable applications come at a high investment costs, whereas their returns only show over the long run, and some of the benefits like climate change are indirect and so not measurable in terms of savings over the life time of the buildings.

This makes it challenging to quantify the actual benefits resulting from the higher investment to establish an ecological neighbourhood instead of a traditional neighbourhood. To motivate the further development of ecological neighbourhoods, they need to be valued by suitable real estate valuation techniques, identifying the actual value of residential houses in these specific locations. **Real estate valuation techniques** need to be flexible and adaptable to these developments (Brown and Matysiak, 2000).

Therefore, the objective of the thesis project is “to get insight into suitable financial valuation techniques for new residential houses in ecological neighbourhoods”.

In this thesis project, it will be determined, which **valuation techniques** provide the best basis for setting the value, for the financing of new residential real estate in ecological neighbourhoods. Results of this thesis project can be used by **Facility and Real Estate Management** (FREM) related organisations, like real estate agents.

The **valuation of new real estate** is accompanied by more uncertainty and has a different approach than the valuation of existing real estate (Ten Have, 2007 a and b). A financier is focused on certainties and risks (Scarrett, 2008). Each valuation must look at what the value of the position is if the object would come to the bank in the unlikely event (Portilla, 2019). To gain an understanding of the financial valuation techniques for new residential houses in ecological neighbourhoods, this study is based on the objective, main research question and sub-questions presented in chapter 2.

The theoretical background of chapter 4 will lead to a conceptual model presented in chapter 5, which shows the relation between the core concepts of the main research question based on relations and sub-questions. The chapter in which the research methods of this research are presented is chapter 5.

2 Objective and research questions

Objective

The objective of the research is “to get insight into suitable financial valuation techniques for new residential houses in ecological neighbourhoods”.

Main research question

Which financing valuation techniques are suitable for new residential houses in ecological neighbourhoods?

Sub research questions of valuation techniques

Sub main research question

Which financial valuation techniques are applied for new residential houses in ecological neighbourhoods?

SQ1	What is the valuation requirement for new residential houses in ecological neighbourhoods?
SQ2	What are the advantages and disadvantages of the current valuation techniques?
SQ3	In which way do technical and social environmental aspects influence the financial valuation techniques?
SQ4	Which factors may be included in the financial valuation of new residential houses?
SQ 4.1	Which characteristics of the individual houses may be involved in the financial valuation?
SQ 4.2	Which characteristics of the location of the houses may be involved in the financial valuation?
SQ 4.3	To what extent is it possible to include the added value of the ecological neighbourhood into the financial valuation?

Sub research questions of ecological neighbourhoods

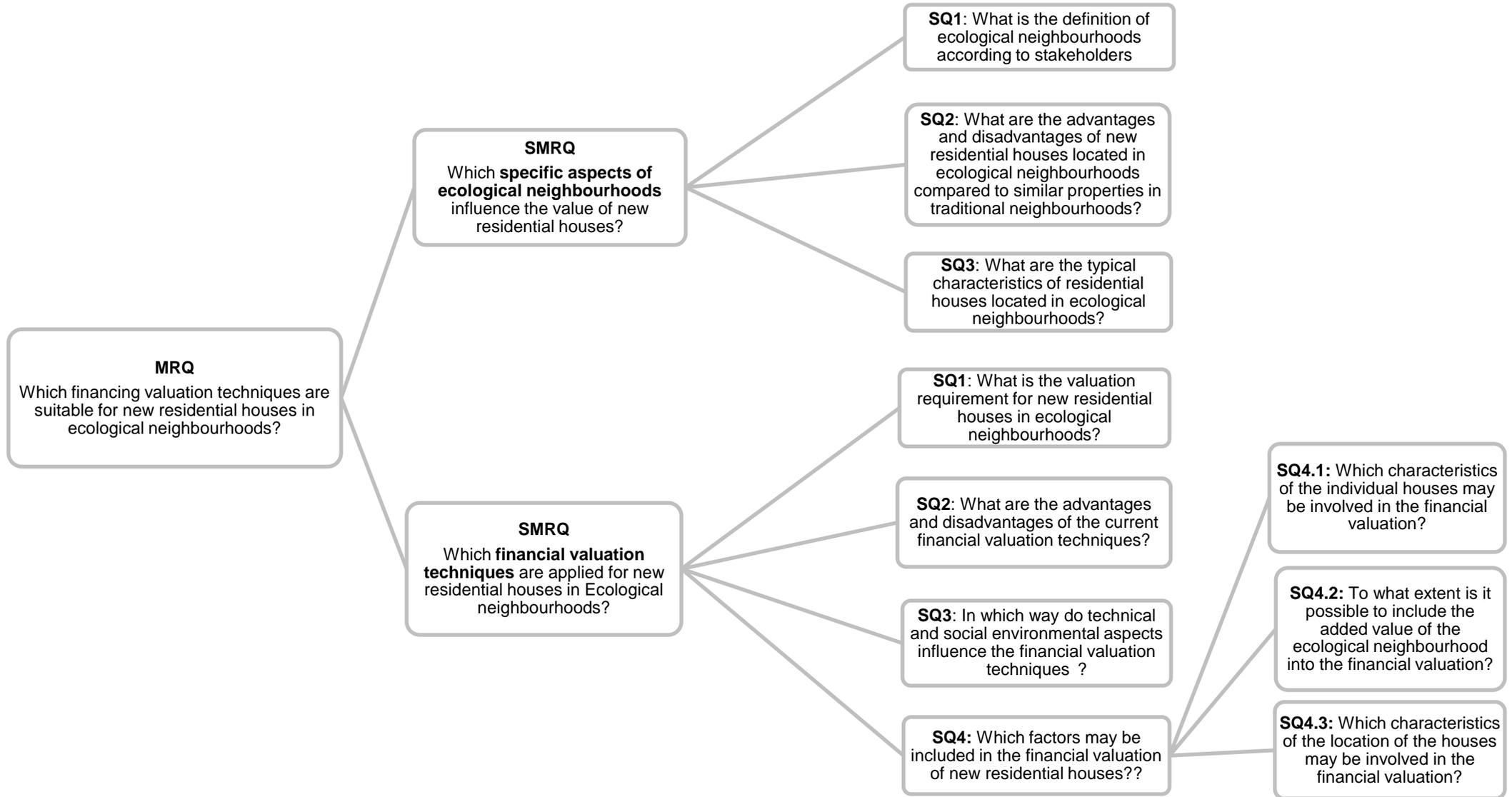
Sub main research question

Which specific aspects of ecological neighbourhoods influence the value of new residential houses?

SQ1	What is the definition of ecological neighbourhoods according to stakeholders?
SQ2	What are the advantages and disadvantages of new residential houses located in ecological neighbourhoods compared to similar properties in traditional ecological neighbourhoods?
SQ3	What are the typical characteristics of residential houses located in ecological neighbourhoods?

Based on the literature review in chapter 4, the research objective, and research questions are formulated. The conceptual model in chapter 5 shows the relation between the core concepts of the main research question. Based on these relations, sub questions are formed which are presented in the following figure 1 **overview of research questions**.

Figure 1. Overview of research questions (By author, 2019).



3 Problem statement

The author of this research has chosen to investigate suitable real estate valuation techniques determining financing valuation of new residential houses in ecological neighbourhoods, because of expected developments (Warren-Myers, 2012).

For this research that **specific purpose** is finding ecological neighbourhoods and real estate agents who value residential properties in these specific locations. Based on the recommendation for further research from Jansen van Vuuren (2017) this research will focus on the improvement needed between current real estate valuation theory, methods, and models. Applying real estate valuation techniques is about using the **right assumptions by common sense**, realising the nature of real estate is **illiquid** and using variables and digital tools because of trends like **globalisation** and **digital revolution** (Portilla, 2019). This research will analyse the impact of rapidly changing **urban sustainability** on real estate valuation techniques.

Regarding, as explained in theories of Geltner, Miller, Clayton and Eichholtz (2014), that:

Financial forecasts are based on sensitivity analysis and simulation. Some projections can be wrong, simply confronting the fact that real estate assets are **risky investments**. The fundamental way dealing with risky investments, is using the discount rate to bring back cash flow projections to present value. And the main point of the cash flow proforma is, that projections should be unbiased, that is most likely or expected amounts. (p. 248)

Van Hal (2009) suggests that there are many opportunities available for improvement of collaboration on **sustainability** with stakeholders in the regular construction sector, benchmarked against the construction of ecological neighbourhoods. Creating sustainable houses with increased **market value** for valuation.

Change is necessary, in view of the urgent **ecological crisis**, globalisation and digital revolution (Portilla, 2019). However, seizing current opportunities calls for radical changes in thought and action (Chakkol, Johnson and Finne, 2019). Even if a choice has been made to change direction, simply optimizing, making minor changes to the current situation, the goals to solve the ecological crisis will not result in the needed goals being reached. Hence, the following is the problem statement of this Master Thesis:

Problem statement:

It is unclear how suitable valuation techniques can be used for determining financing valuation for new residential houses in ecological neighbourhoods.

4 Literature review

4.1 The concept of ecological neighbourhoods

The dominant factor separating urban and non-urban environments is population density. **Urban density** increases the access to resources and fulfilment of the innate human needs to others (Glaeser, 2011). To **avoid negative externalities**, the urban area and its inhabitants enforce pressure on existing citizens and any potential entrants. In the Netherlands, three-quarters of growth is expected in large cities with currently 100.000+ inhabitants (Centraal Bureau voor de Statistiek, 2019). As **urban areas** expand to accommodate increased and more active populations, space becomes scarce and infrastructural reconstructions become prohibitively expensive (Anand, Quak, Duin and Tavasszy, 2012). Additionally, the psychological availability of resources is a constraint to the benefits of urbanisation. Urban saturation occurs “when a population reaches a point at which existing resources will no longer sustain the needs of the existing population” (Rose, Mollenkopf, Autry and Bell, 2016, p. 155). As urban density increases, resources as fossil fuel, public land for parks, houses and congested infrastructure become objects of conflict between urban members. Ecological neighbourhoods can **contribute to solving these issues**. As most of urbanisation processes for the future are expected to take place in cities with 100.000+ inhabitants, the ecological neighbourhoods in these towns are in the focus of the present study.

According to Van Hal (2016), **ecological neighbourhoods** are “residential area, developed by integrated sustainable urban planning, regarding ecological, **social and technical characteristics**, which are built in line with national sustainable policy measures” (p.12).

Van Timmeren, Sidler and Kaptein (2007) describe ecological neighbourhoods as:

The outcomes of extra-ordinary private initiatives supported by dedicated local authorities. Its origin lies in the establishment of **integrated sustainable urban planning**. This leads to the creation of unique ecological neighbourhoods where highly committed residents live and work in human- and environmentally-friendly environment. (p.1)

Nowadays, sustainable **urban planning** is an initiative of the **Dutch Government**, making it a responsibility and obligation to builders and residents. The policy concept of **sustainability** has its origin in the Brundtland Report of 1987 and was concerned with the tension between the aspirations for a better life and the limitations imposed by nature (De Bruijn, 2018).

4.1.1 Typical characteristics of ecological neighbourhoods

Many **sustainable urban** design themes can be found in ecological neighbourhoods. Apart from the considerable emphasis on sustainable energy and materials, social, cultural, landscape and economic sustainability also play an important role.

This ecological principle is used to design living environments with the diversity, stability and resilience of natural ecosystems. The method also offers pointers for designing the built environment. The development and construction of ecological neighbourhoods took the existing qualities and characteristics of the landscape into consideration as much as possible to create a wide range of urban, natural and agrarian elements. Important **social characteristics** aim is to bring the residents into closer contact with natural processes, especially through local food production (Van Timmeren et al., 2007). Typical **technical characteristics** of ecological neighbourhoods are presented in observation sheets of appendix 5. The **relation** of appendix 5 shows **added value of sustainable characteristics** to achieve **highest valuation** with the **best sustainable houses (Y)**.

4.1.2 Comparison advantages and disadvantages

Advantages and disadvantages of the 4 selected ecological neighbourhoods are introduced in the relation of appendix 5 presenting **added value of sustainable characteristics** to achieve **highest valuation** with the **best houses (Y)**. Several aspects that are listed as advantages of ecological neighbourhoods, also come at **high cost**. The counterparts are shown in appendices 6 and 8 summarising the disadvantages. There is a clear overlap between the disadvantages in forms of higher costs and the costs identified and monitored by **green accounting** presented in subchapter 4.2.6.

4.2 Real estate valuation techniques

According to Ten Have (2007a) the definition of **real estate** is "a property that exists independently of other objects and is separately identifiable as such" (p.162). Roodhof (2012, p.33) and Portilla (2019) describe real estate as "an illiquid business where long processes with uncertainty are prevalent".

Within this thesis project the focus is on real estate valuation techniques of new **residential houses** in ecological neighbourhoods. Portilla (2019) states "residential houses are buildings that function as homes. Houses can range from simple dwellings to complex fixed structures of wood, brick, concrete or other materials" (p.1).

Pagourtzi, Assimakoulou, Hatzichristos, and French (2003) explains **valuation techniques** as "the determination of the amount for which the property will transact on a particular date." (p. 383). Roodhof (2012) states that traditional "valuation techniques are appraising the investments, if companies that make these investments are not capable of changing the project course, as a response to continuing new insights" (p.31).

By applying valuation techniques, it is possible to work based on **financing valuation**. Therefore, the European Mortgage Federation directive defines mortgage lending value (Ten Have, 2007b, p.37).

The financing valuation stated as **mortgage lending value** described by Ten Have (2007b) is:

The value of a property item established by a valuator based on a cautious forecast of the future marketability of the property, taking sustainable long-term aspects of the property, normal and local market conditions, the use made of the property at that time and any other purposes for which it is suitable and where speculative factors may not be in the settled mortgage lending value, into account. (p.37)

Fixing the mortgage lending value is calculated according to established principles, in which the prudence is guaranteed. From the point of view of certainty and **transparency** it is better to use mortgage lending value in the present project, a purer valuation than the execution value as it creates more **reliable information** for this thesis project.

Within the European Mortgage Federation the following principles are attached to the mortgage lending value (Ten Have, 2007b, p.328):

- A cautious appreciation of future market approach;
- Identifying and eliminating speculative elements;
- View normal and local market conditions;
- Taking as much account as possible of long-term aspects of the property object;
- Calculate the actual use and alternative uses of the property object for that purpose;
- A transparent and clear statement of the valuation method.

4.2.1 Specifics of valuation techniques

Valuation techniques differ from each other by **calculation methodology, variables, and intent** (Witvoet, Vlek, Gordon Brown and Van de Ven, 2007). They can be used side by side and for control.

There are several valuation methods presented in the following figure 4 **overview of valuation techniques**. According to Pagourtzi et al., (2003) the valuation techniques can be grouped in **traditional techniques** and **advanced techniques**. In the following paragraphs 4.2.2, 4.2.3, 4.2.4 and 4.2.5 the specifics of valuation techniques are explained more in-depth.

In the **conclusion** of chapter 8 of this Master Thesis, **5 characteristics** of valuation techniques, presented in a **matrix**, are explained, **elaborated with an in-depth vision** and **critical discussion**. According to De Wild (2019) there are 5 important characteristics given to the valuation techniques like: Reliable, conservative, transparent, speed and risk-analysis.

There is **no exact science** at valuation **calculation methodology** within the real estate industry. Exact valuation to amounts specific numbers “behind the comma”, can not be argued and motivated. Values will be rounded off. **Variables** and **intent** within the real estate industry, therefore mostly are based on **assumptions** (Geltner et al., 2014). Variables are flexible, dependent of developments, time and persons (Portilla, 2019). Dataset for the **simulation example** of the traditional residual valuation method **suitable for green accounting** in table 8, **results** of chapter 6, and appendix 9 of this Master Thesis is retrieved and **backed up** within **the field of real estate** and therefore is **subjective**.

4.2.2 Traditional valuation techniques

Most traditional methods presented in table 2, figure 4 and appendix 8 are based on some form of comparison to assess the market value of residential houses (Ten Have, 2007 a and b). This can be done by for example comparison of capital or a range of observations which makes a regression model possible.

Table 2. Traditional valuation techniques by author (2019).

1. Comparative approach methods	2. Cost approach methods	3. Income approach methods
---------------------------------	--------------------------	----------------------------

Comparative approach methods (1) mostly exists of comparative methods. The **comparative method** described by De Wild (2010) is “a method of determining the value based on similar transactions of objects” (p.32).

Cost approach methods (2) exists of the land quote technique and the traditional residual valuation method. The **landquote technique** is a percentage of the final value can be considered as a ground value based on similar. The **traditional residual valuation method** is “calculated from the product to a value in the current state by picking up the cost of the proceeds” (De Wild, 2010, p.32).

Within the **income approach methods (3)** the **residual discounted cash flow (DCF)**, the **Decision Tree Analysis method (DTA)**. The DTA method is using a required **Yield**. This method is divided in 3 different sub-methods, namely: Gross Initial Yield method, Net Initial Yield method and DCF method explained by Geltner et al., (2014).

Roodhof (2012) explains the **Real Options theory (ROA)** within income approach methods as follows:

When someone buys an option, he buys the right to engage in that transaction. The seller incurs the corresponding obligation to fulfill the transaction. An option which conveys the right to buy something at a specific price is a calloption. (p.18)

Banks, investors and other **financial institutions** are demanding a better explanation and foundation then these methods which are applied (Roodhof, 2012). A **different approach is required** (Berkhout and Hordijk, 2008).

4.2.3 Advanced valuation techniques

Advanced valuation methods presented in table 3, figure 4 and appendix 8 try to analyse the market by directly mimicking the thought processes of the players in the market to estimate the point of exchange. Advanced valuation methods are mostly applied within commercial real estate, like offices and shopping malls (Pagourtzi et al., 2003). Nevertheless, that does not mean advanced valuation techniques are not suitable for residential real estate valuation.

Table 3. Advanced valuation techniques by author (2019).

1. HPM	2. ANNs	3. ARIMA
--------	---------	----------

According to Yeh and Hsu (2018, p. 260) the hedonic pricing method (**HPM**) (1) is “an advanced valuation technique of the quantitative method of the comparative approach”. The regression model of HPM presented decreases the appraisal costs, but it cannot handle the factors difficult to **quantize**. So, the HPM is often used to deal with the **mass appraisal of real estate**.

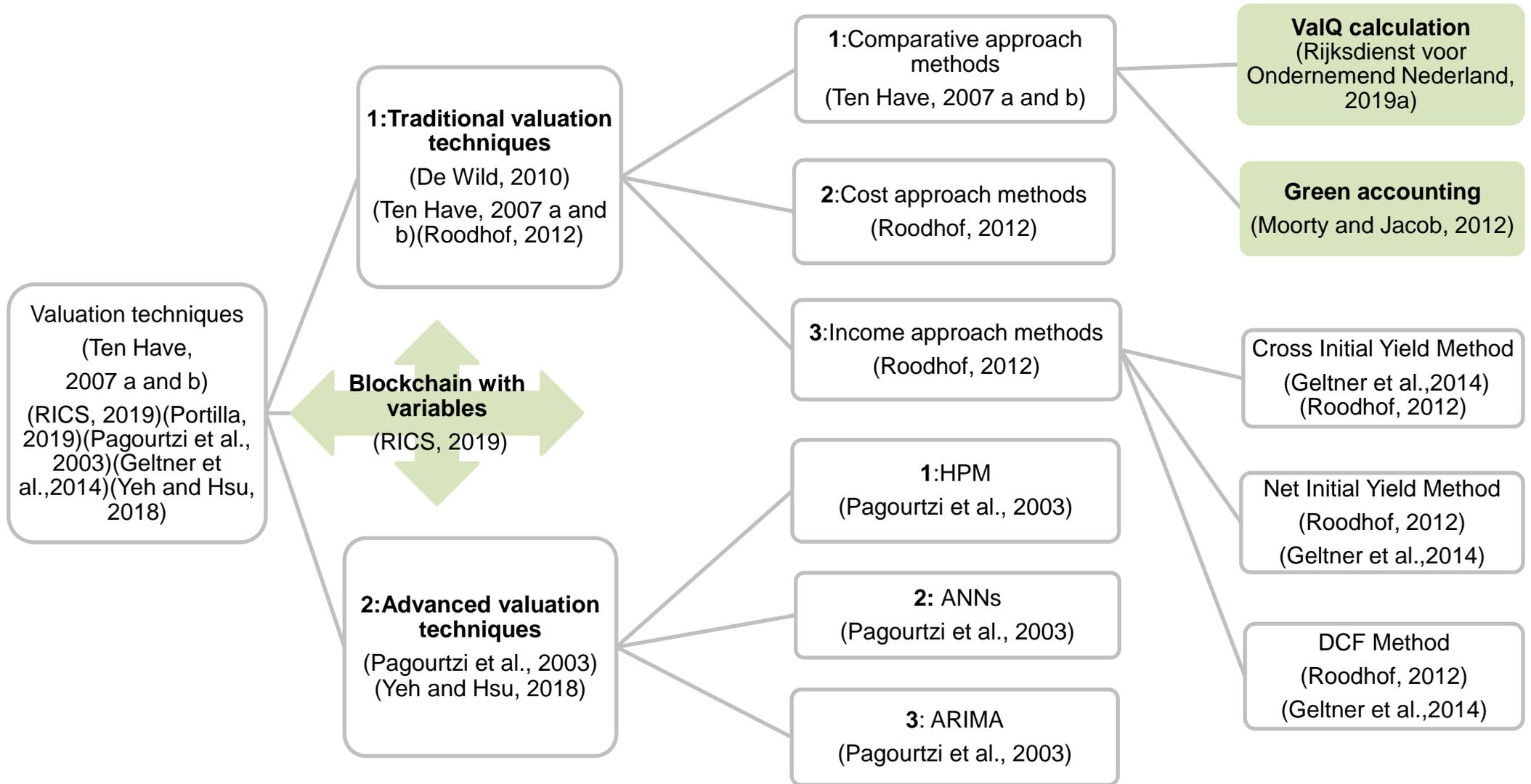
The HPM uses not only the regression analysis, but also artificial neural networks (**ANNs**) (2) or **other artificial intelligence approaches** like autoregressive integrated moving average (**ARIMA**) (3) to establish the estimated price models of real estate (Yeh and Hsu, 2018). Commercial applications of technology like ANNs generally focus on solving complex signal processing or pattern recognition problems. ARIMA can be described as a statistical analysis model that leverages time series data to forecast future trends (Pagourtzi et al., 2003).

4.2.4 Comparison advantages and disadvantages

There are disadvantages of current valuation techniques such as traditional thinking or no market valuation (Ten Have 2007 a and b). Also advantages such as flexibility to change and transparency presented in appendix 7.

Appendix 8 presents advantages and disadvantages of traditional and advanced valuation methods in **tree diagrams**. Appendix 9 presents (**DCF**) **calculations** which can be applied for appraisal, adding value with **sustainable characteristics**. Chapter 8 of this Master Thesis elaborates and explains an **in-depth conclusion** of traditional and advanced valuation techniques.

Figure 4. Overview of valuation techniques (By author, 2019).



4.2.5 Variables and tools involved to valuation

Within valuation of residential houses **variables** shall be involved. According to Witvoet et al., (2007) and De Wild (2010) there are variables like size of property, size of land, number of rooms, building year, blank value, growth rate, density, market rent, incentives, development costs, energy costs, advisory costs, environmental costs which are included in the calculation of the land value and value of buildings presented in appendix 9. Nevertheless, valuations are “**not an exact science**, so there always is some degree of **subjectivity** for estimating variables” (De Wild, 2010, p. 85).

To calculate these variables **ValQ calculation** can be advised to apply by real estate agents. This ValQ calculation is a business **modeling digital tool** that enables an organisation to perform agile planning advised by Rijksdienst Voor Ondernemend Nederland (2019a).

RICS (2019) introduces **blockchain** as a **tool** with **new knowledge** for calculating sustainable variables for valuation and creating transparency for the real estate industry presented in figure 4. Applying blockchain will be a future **transparent** development within the real estate industry **creating uniformity**.

Described by Swan (2015) blockchain is:

The public ledger of all transactions that have ever been executed. It is constantly growing as miners add new blocks to it to record the most recent transactions. The blocks are added to the blockchain in a linear, chronological order. (p. 10)

4.2.6 Lessons from green accounting

Within ecological neighbourhoods technical and social **characteristics and variables of sustainability** are taken into account. It makes sense to look into the possibilities to apply the principles of green accounting to the financial valuation of these properties. Additional costs are disadvantages of ecological neighbourhoods and resulting benefits can be quantified in the valuation by green accounting.

Green accounting has been defined by Moorty and Jacob (2012) as “the identification, tracking, analysis, and reporting of the materials and cost information associated with the environmental aspects of an organisation” (p.4). An overview of green accounting measures can be found in table 5 bellow. Most of the items mentioned in this overview are to some extent relevant for the **residential houses located** in ecological neighbourhoods. In appendix 9 an example of ValQ calculation within **the field** of real estate retrieved by participant real estate agent Mr. M. Koopmans, **suitable for green accounting**, is presented.

Many environmental costs can be significantly reduced or eliminated as a result of business decisions, ranging from operational and housekeeping changes to investment in greener process technology to redesign processes or products (Moorty and Jacob, 2012). Some of the aspects named in green accounting are already applied in valuation today, while some others may be used to a more limited extent. It is also important to note that the objective of green accounting is to **track costs**, while the objective of valuation is to **identify value**, so only the costs that create actual value increase may be involved in the valuation. The field research will aim to identify which of the items of green accounting may be suitable for this.

For example, “environmental Protection Costs”, related to energy saving measures, are quantified and involved in the valuation nowadays. Valuers and real estate agents use the digital tool “*energy saving explorer*” to achieve **higher valuation** of new residential houses in ecological neighbourhoods. This **digital tool** shows several energy saving possibilities of residential houses and directly calculates the financial advantage (Portilla, 2019). The energy saving explorer for professionals gives insight quick and easy into the possibilities and illustrates the effects of **energy saving** on power costs and the energetic quality of houses (Rijksdienst voor Ondernemend Nederland, 2019a).

Table 5. Green accounting measures (Moorty and Jacob, 2012).

Costs	Green accounting issues and scope
Pollution Prevention	Costs incurred to prevent air and water pollution
Environmental Protection	Costs of energy saving measures
Resource Recycling	Costs incurred for waste reduction and disposal
Environmental Restoration	Cost of environmental restoration operations
Management Costs	Management-related environmental protection costs
Social Promotion	Costs for participation in social activities
Activities Costs	Environmental protection costs for research

4.2.7 The influence of context of Dutch ecological neighbourhoods on valuation techniques

Valuation techniques in relation with ecological neighbourhoods are applied in this Master Thesis, because new sustainable concepts for accommodations and service delivery are being developed in which real estate is seen as a concept that supports the optimal performance of customers. Ecological neighbourhoods are new accommodations in **sustainable urban planning** regarding **environmental knowledge** and **environmental attitude** in which living, and working are **integrated** (Van Hal, 2016).

Customers demand sustainable integral living and workplace solutions. In the specific field of real estate an increasing integration of accommodation as **added value** to real estate and **Facility Management (FM)** can be observed (Jensen and Van der Voort, 2017). FM can be integrated into managing the development of ecological neighbourhoods, processes, and collaboration between stakeholders in the construction sector (Lindholm and Leväinen, 2006). Creating sustainable houses with increased **market value** for valuation. Outcomes of this research may impact the strategy, policies and market approach of organisations such as Dutch financial institutions, real estate agents, social houses organisations and Municipalities. In this thesis project introducing **tools** like **blockchain, ValQ calculation or green accounting**, regarding the influence of the location and sustainable variables of new residential housing in ecological neighbourhoods on the valuation will be the **novelty**.

The relation between real estate valuation techniques and determining financing valuation for sustainable applications of new residential houses in ecological neighbourhoods as described above are visualised in appendices 5, 6 and 8 based on literature review, interviews and Ten Have (2007 a and b).

5 Research methods, operationalisation and analysis

5.1 Conceptual model

The theoretical background has led to the following conceptual model which shows the relation between the core concepts of the main research question. Based on these relations, sub-questions are formed as presented in chapter 2.

A conceptual model will help to identify the core concept and its (sub-) aspects. Furthermore, this model will allow the research topic to be measurable by the core concepts and illustrate the relationship between the topics. The conceptual model's aim is to identify the relevance, research area and design (Saunders et al., 2012).

The following conceptual model figure 6 is built from the information which has been analysed in the literature review of this Master Thesis. This conceptual model presents there is a **relationship** between the type of neighbourhood of new residential houses in traditional and ecological neighbourhoods, **added value**, technical and social sustainable characteristics requiring suitable valuation techniques.

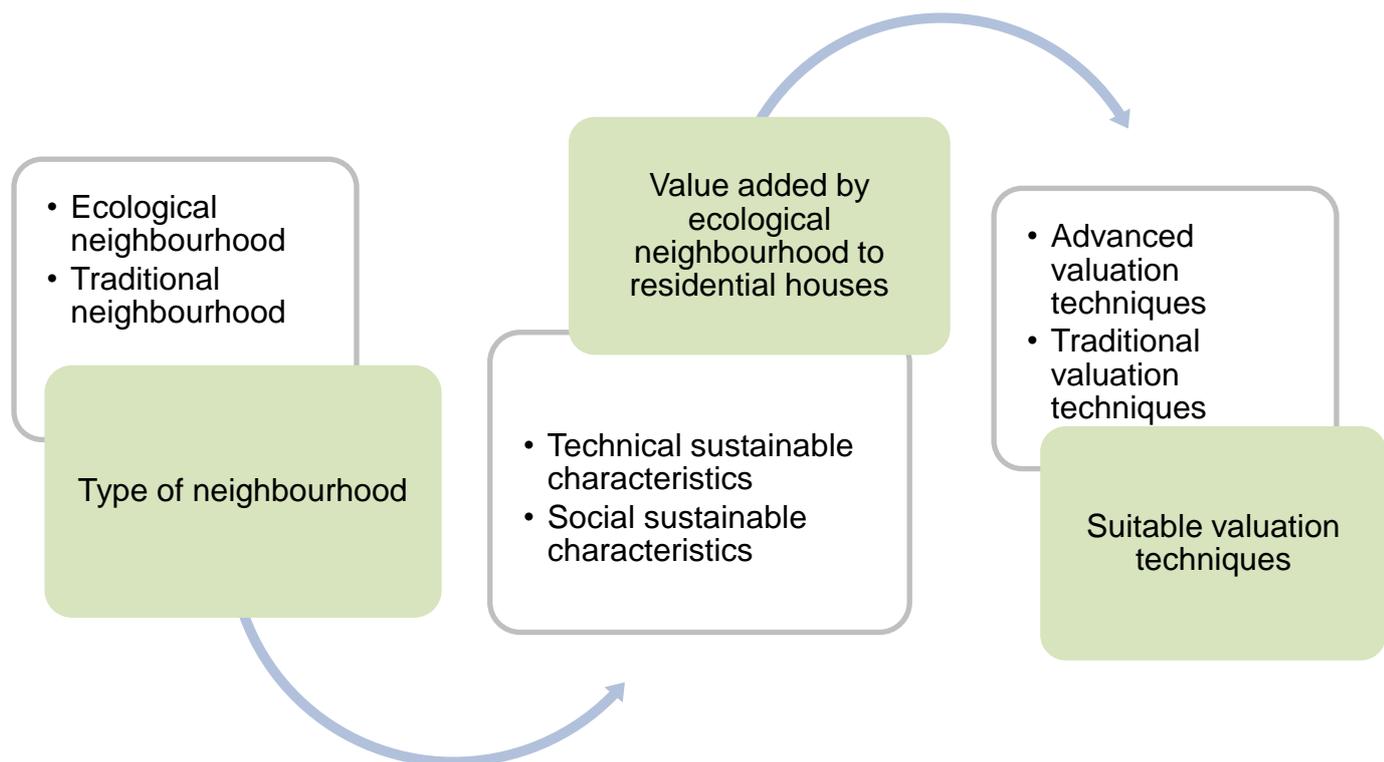


Figure 6. Conceptual model by author (2019), based on Laroche, Bergeron, and Barbero - Foleo (2001).

5.2 Research strategy

This study is based on **qualitative research**. Qualitative research is primarily exploratory research. Qualitative research is used to uncover trends in thought and opinions, and dive deeper into the problem (Saunders et al., 2012).

Case studies are often used to answer 'how' and 'why' questions (Baxter and Jack, 2010), which is the case in this study, because the main question is about how valuation techniques are applied and which are the most suitable ones for residential properties ecological neighbourhoods. The use of a case study provides a rich understanding of the whole context of the research (Saunders et al., 2012), it examines the interrelation of the phenomena and the context. This is relevant in this study because the combination of valuation techniques and ecological neighbourhoods is relatively new and therefore broad research is required to gain more understanding of the phenomenon (valuation) in this specific context (Dutch ecological neighbourhoods).

There are several classifications within a case study. This study contains an illustrative case study, which has a descriptive character and is intended to add realism and in-depth examples to other information (Baskarada, 2014). A case study contains research within 1 organisation, or a group of organisations (Verhoeven, 2011) in which a phenomenon is researched within its real-life context (Saunders et al., 2012). The choice for using a **multiple case study** instead of a single case study is made because a multiple case study can serve 2 purposes: Finding differences between cases and/or finding similarities between cases. The subject of this study is relatively new and therefore it is interesting to find out whether cases show similarities or differences (Baxter and Jack, 2010).

5.3 Data collection techniques

It is common to use multiple data collection techniques within a case study which is called triangulation. This study is based on a multi-method of qualitative studies, meaning that more than 1 data collection technique will be used within only qualitative research. This study contains 2 kinds of qualitative data collection, namely interviews and deskresearch (Saunders et al., 2012).

5.3.1 Interviews

Information will be gained through semi-structured interviews, meaning that the topics of the interview are determined beforehand, but the order in which the questions are asked does not matter. Besides, semi-structured interviews allow the participant to add information during the interview. Semi-structured interviews are chosen because this kind of interviews are more flexible and allow the researcher to gain a better understanding of the perspective of the participants, which is important in a relatively new study like this (Baskarada, 2014).

5.3.2 Desk research

Only reviewing literature does not always reflect reality (Baskarada, 2014). Therefore, in this case study desk research will take place to add information and confirm information from the literature review and interviews, in the form of analysing urban plans or other relevant documents of the ecological neighbourhoods included in the case study. The desk research is seen as an addition to the information gathered by the interviews.

5.4 Operationalisation

Based on the theoretical background described in chapter 3, operationalisations are made, meaning that the core concepts of this study are disaggregated into measurable aspects. These aspects are used to draw up the topic lists for the interviews and checklists for deskresearch (document analysis), as presented in **4 tree diagrams** of appendix 8.

5.5 Sampling

In case study based research, the sampling takes place in 2 **stages**. The first step is the **selection of cases**, followed by the **selection of individual participants and data sources**.

Choosing the right sample within a qualitative study is all about collecting specific cases (Saunders et al., 2012). The goal is to find cases that will enhance current information found in the literature. Sampling within a case study is about gaining a deeper understanding of the phenomena and therefore often a non-random or non-probability kind of sampling is used within case studies. This kind of sample is not representative of the total population but is chosen based on relevance for the research topic (Ishak and Abua Bakar, 2014).

5.5.1 Case selection

Within non-random sampling, there are different case selection techniques. This research uses the purposive sampling technique. In this kind of sampling, the researcher selects cases with a specific purpose in mind. For this research that specific purpose is finding ecological neighbourhoods and real estate agents who value residential properties in these specific locations (Ishak and Abua Bakar, 2014).

There are several ecological neighbourhoods according to Van Hal (2016). The ecological neighbourhoods differ in size, amount of residents, amount of technical and social sustainable characteristics. Ecological neighbourhoods are selected which are located in mid size Dutch towns, as these settlements are expected to grow most in the future. At the same time, the selected neighbourhoods differ to some extent in terms of size and characteristics to be able to identify whether and how these differences are realised in the valuation of properties in the various locations. Selected compared ecological neighbourhoods are presented in appendix 6. Due to limitations in time, the case study includes 4 ecological neighbourhoods with related stakeholders.

5.5.2 Data source selection

As mentioned before in paragraph 5.2, this study contains 2 types of sources: **Interviews** and **documents**.

5.5.2.1 Interviewees

Interviewees are selected also in a non probability based way, with a combination of purposive and quota sample. Quota sample in this specific project means that respondents are selected to represent all the 4 cases selected. Purposive approach means that certain criteria are used for the selection of respondents per case. Due to the research design being a case study, it is important to approach the phenomenon within ecological neighbourhoods from different perspectives.

Therefore, besides interviews with experts, like **Professors and members of RICS** (2019), stakeholders **with expertise of valuation** related to ecological neighbourhoods like **real estate agents, valuers** and **developers** will be approached. Table 7 provides an overview of participants who are included in this research.

Table 7. Overview participants (By author, 2019).

	Participants	Functions
	Prof. Dr. Ir. Mrs. A. Van Hal	Professor Sustainable building and development Nyenrode Business University
	Prof. Mr. J. Portilla	Professor Instituto de Empresa (IE) Business School Master of Real Estate Developments (MRED)
	Ir. Mr. D. Samson	Chairman RICS valuation conference 2019
	Ir. RMT. Mrs. C. Brouwer	Tutor Strategic Asset Management and valuator Saxion University of Applied Sciences
Ecological neighbourhoods		
E.V.A. Lanxmeer Culemborg	1. Mr. M. Jellema	Real estate agent and valuator Weeda and Jellema
	2. Mr. T. Van Hillo	Real estate agent and valuator Weeda and Jellema
Woonderij EOS Zutphen	3. Mr. M. Koopmans	Real estate agent and valuator Eggink Maalderink Makelaardij
De Kiem Arnhem	4. Mr. R. Boesveld	Real estate agent and valuator Willemsen Makelaars
	5. Mr. J. Bleijenberg	Real estate agent and valuator Dynamis Strijbosch Thunnissen
	6. Mr. M. Muller	Real estate agent and valuator Dynamis Strijbosch Thunnissen
Bewust Wonen Werken Boschveld (BWVB) 's Hertogenbosch	7. Mr. R. Pijnenborgh	Developer and architect Archiservice
	8. Mr. A. Bilderbeek	Real estate agent and valuator Dynamis Bilderbeek and partners

5.5.2.2 Desk Research

There are 2 aspects to be studied: New residential houses of ecological neighbourhoods and sustainable characteristics. The desk research on ecological neighbourhoods will be conducted by **document analysis**, which is based on the literature review in chapter 2.

According to Slack and Rowley (2001) 2 aspects will be studied:

1. Characteristics of sustainable applications which are made in new residential houses of ecological neighbourhoods.
2. New residential houses of ecological neighbourhoods will be compared with traditional residential houses.

Simulations are done on the valuation by different valuation techniques. Data for this is gathered to be used as input for the calculations from **general** and **specific** sources presented in appendix 3.

5.6 Data analysis

5.6.1 Analysis of interviews

During the actual analysing part of this study, open coding, axial and selective coding data driven **without preconceptions** will be used. **Open coding** is about reducing the data in the interview transcript. Every section of the interview transcript gets a unique label, also called a code, including a short description of the message. This approach results in the categorisation of the information in the interview transcript (Saunders et al., 2012), which makes it possible to compare the cases and to find differences or similarities.

Axial coding refers to the process of looking for relationships between categories of data that have emerged from open coding (Saunders et al., 2012, p. 571). It indicates a process of theoretical development. The essence of this approach is to explore and explain the phenomenon valuation of the location and sustainable characteristics of new residential houses in ecological neighbourhoods.

After open coding and axial coding, **selective coding** will be applied. Explained by Saunders et al., (2012, p. 681) selective coding is the process of integrating categories to produce theory in grounded theory. In this stage the emphasis is placed on recognising and developing relationships between principal categories that have emerged from this grounded approach in order to develop an explanatory theory.

To summarise, the data analysis contains the following steps by Baxter and Jack (2010):

1. Making transcripts of the interviews;
2. Dividing interview transcripts into little fragments;
3. Labelling each fragment with a code;
4. Grouping codes, resulting in a codebook;
5. Looking for relationships by selective coding;
6. Comparing cases by selective coding.

5.6.2 Content analysis of documents

This approach described above for the analysis of the interviews will also be applied to the documents gathered by deskresearch (Verhoeven, 2011).

In this research, several simulations of cases with different scenarios are shown in appendix 10 to illustrate what kind of influence changes in input parameters have on the value of new residential houses in ecological neighbourhoods. Whereas the real estate professionals today most of the time use the traditional methods, this research **highlights** the possibilities of **new methods and digital tools**. Because the traditional methods are static and rigid, new methods and tools are able to appraise possibilities, where the traditional methods are not.

5.7 Research methods per sub-questions

Not all data sources will be used for the sub-questions. There is specific identification presented of what helps to answer which sub-question in the table of appendix 3.

5.8 Validity and reliability

5.8.1. Validity

Validity is about whether findings of the research are really about what they appear to be about and about the extent to which the research is free from systematic errors (Verhoeven, 2011). Three types of validity are discussed for this research: Construct validity, internal validity, and external validity.

5.8.1.1 Construct validity

Construct validity is about operationalisation, in order to make the research measurable (Trochim, 2006). To improve the construct validity, operationalisation is based on academic research and literature review of De Wild (2010), Van Hal (2016), and Van Timmeren (2008), and is used for creating interview questions. Unclear questions will be further explained, adapted during the interview and the researcher will make sure participants understand the questions (Greener, 2008). The last approach to guarantee construct validity, used in this study, is asking participants to review the interview transcripts in order to enhance the accuracy of the information (Baskarada, 2014).

5.8.1.2 Internal validity

Internal validity is about justifying causal relationships in gathered information. In this study valuation techniques are the depended variable and ecological neighbourhoods is the independent variable. The internal validity can be tested by asking if the independent variable account completely for a change in the depended variable, or if there are other factors that influence the outcome (Greener, 2008). In this study, internal validity is guaranteed by using **triangulation** in the form of using multiple methods of data-collection in 1 study, which must ensure that relationships are not based on coincidence as advised by Saunders et al., (2012).

5.8.1.3 External validity

External validity is about knowing whether findings may be generalised to other cases. (Baskarada, 2014). The question must be asked whether the chosen sample is representative of the total population, which is also called population validity (Verhoeven, 2011). The main focus is to gain in-depth insight to the specifics of the cases without general conclusions. Literature describes methods for optimal objective generalisation in casestudies. First, it must be ensured that a broad range of attributes is researched within 1 case. Secondly, similarities between attributes in cases must be high to improve the generalisability. Therefore, thirdly, unique situations between cases must be as few as possible. Lastly, the situations must be relevant for the research, which is about distinguishment of indirect and direct relevant attributes.

5.8.2 Reliability

Reliability is about demonstrating that the same results will be obtained if the study is repeated later in time by other researchers (Baskarada, 2014). It is about preventing accidental errors (Verhoeven, 2011) and about the consistency of measurement (Heale and Twycross, 2015).

At first, the reliability in this study will be guaranteed by standardising the case study process, meaning that every step will be captured in a logbook. This standardisation also includes creating a database with all used documents (Baskarada, 2014). According to Shenton (2004), the logbook must contain the following information:

- The research design and implementation, which included planning of how the research was conducted;
- A detailed way of data gathering;
- A reflection of the research process, in which the effectiveness of the process is evaluated.

Further, there are 4 threats to reliability: Participant error, participant bias, observer error and observer bias. The participant error assumes that the time of the interview influences the answers of the participant. Due to the limited time of the researcher as well as participants this one is hard to prevent. The participant bias assumes that answers of the responder can be influenced by other people, for example, their boss. To prevent this from happening, the interviews will take place in a private place and the participants remain anonymous. The observer error and observer bias assumes that different observers can ask questions in different ways and interpret them differently, which harms the reliability. This is not applicable in this study, because there is only 1 researcher (Saunders et al., 2012). At last, 1 thing that makes this study less reliable is the snapshot of observations (Slack and Rowley, 2001). These are more reliable if they are repeated (Verhoeven, 2011). Due to time limitations, this is not possible. However, it is not expected the observed aspects are dependent on changes. Besides, this less reliable part of the study will be captured by doing interviews and deskresearch (triangulation), which will improve reliability (Verhoeven, 2011).

The operationalisation research is based on literature review. This contributes to the reliability of the study.

The sample size is relatively small, based only on **stakeholders with expertise on valuation** of 4 selected ecological neighbourhoods, and **new knowledge of developments on sustainability** within the real estate industry (Portilla, 2019). This is typical to casestudies, nevertheless, a larger sample size and more participants would have improved the reliability of the study. To improve the reliability of the research, the interviews are recorded and transcribed.

6 Results

6.1 Real estate valuation techniques

In this chapter, the results, data, findings and analysis of the performed interviews about the topic valuation techniques and 4 observations are presented and interpreted according to their suiting research question. Findings and information are, if possible, related to the previously performed literature review and presented in appendix 10.

Sub main research question

Which financial valuation techniques are applied for new residential houses in ecological neighbourhoods?

To answer this **sub main research question** an average of the outcome is applied: **Approximately 70%** of the participants agree that suitable valuation techniques are applied for new residential houses in ecological neighbourhoods. Most of all participants experts require more attention for suitable financial valuation techniques for new residential houses in ecological neighbourhoods. According to Roodhof (2012) it is not possible with the traditional methods to determine uncertainties, let alone to value uncertainty. Traditional methods are static because they assume that uncertainty has a normal distribution. In general, the advice of the experts is **changing old economy thinking** in the **construction sector** due to new technological, sustainable and social developments. Facing new challenges in the construction sector is needed (Van Hal, 2009).

The first question of the performed interview is instructed to gain data and information to answer the **first sub research question**. Insight was gained about real estate and valuation techniques by interviews with real estate agents and valuers. The first sub research question that will be answered is:

SQ1. *What is the valuation requirement for new residential houses in ecological neighbourhoods?*

To answer the first sub question an average of the outcome is applied: **Approximately 60%** of the participants mentioned the **lowest pricing** as a reason for valuation requirement for new residential houses in ecological neighbourhoods. In general buyers of houses **require the lowest pricing**. At first hand, not very much attention is paid to sustainable elements of new residential houses in ecological neighbourhoods, yet. Now ecological neighbourhoods attract a select group of people who are willing to pay for it.

Participant real estate agent and valuator Mister T. van Hillo stated: “We are looking how we are able to increase purchasing willingness by means of public funding. But, as a broker, we do not see it in return. When financing with “the green mortgage” the condition of an EPC standardisation is 0, I believe. The houses that are built in ecological residential area Eva Lanxmeer all have 0 EPC standardisation. Co-financing is possible to achieve that. We as a broker only see the buyer. We will we not see the front financing” (Translated from Dutch by author, 2019).

The second question of the performed interview is instructed to gain data and information to answer the **second sub research question**. Insight was gained about real estate and valuation techniques by interviews with real estate agents and valuers. The second sub research question that will be answered is:

SQ2. *What are the advantages and disadvantages of the current valuation techniques?*

To answer the fourth question an average of the outcome is applied: **Approximately 80%** of the participants believe there are **advantages and disadvantages** of current traditional valuation techniques. Participants agree with Jansen van Vuuren (2017) there is an increasing mismatch between real estate valuation theory, methods, techniques, and models because they are based on **neoclassic economic thinking** and not based on the complex economy which is dynamic and non-linear. It became clear that traditional valuation techniques are **rigid and static**. They are not capable of determining uncertainties. Risk is processed in the risk premium, which together with the risk free interest rate makes up the required return. For the traditional methods, the required return is the reflection of risk.

Participant real estate agent and valuator Mister M. Muller stated: “I am using the comparative method. I compare homes with common items in the region, in this case in Arnhem. Of course, there is the standard sustainability paragraph in my valuation report. To be able to supply the bank, the sustainability paragraph is required. There are ten parts to assess how durable a home is. When I am looking at the district Schuytgraaf, where the ecological residential area is De Kiem, these are all young homes. And those homes are all connected to the district heating, without gas, with underfloor heating, with solar panels and well insulated. So, then I find the extra value of an ecological residential area not very large. I just compare it with the property in the regular residential area. Maybe an ecological residential area is even a disadvantage because a garden part with other residents is shared. A joint barn and no parking on your own driveway. That can even be detrimental to the value of the property.” (Translated from Dutch by author, 2019).

The third question of the performed interview is instructed to gain data and information to answer the **third sub research question**. Insight was gained about real estate and valuation techniques by interviews with real estate agents and valuers. The third sub research question that will be answered is:

SQ3. *In which way do technical and social environmental aspects influence the financial valuation techniques?*

During the interviews the traditional methods were discussed. To answer the third question an average of the answers is applied: **Approximately 80%** of the participants agree technical and social environmental aspects may be included in the financial valuation of new residential houses. For example, participants believe the **quality of aging houses** of ecological neighbourhoods has a long-term negative impact on both maintenance costs and sales valuation of the houses.

Participant real estate agent and valuator Mister M. Jellema stated: “The valuation techniques and methods are the same. The new regular homes are technically even better than the homes in ecological residential area Eva Lanxmeer. As a broker, we are looking purely for **references**. What is the **square meter price**? We do not have a specific valuation method. We are simply looking for supply and demand in the market.” (Translated from Dutch by author, 2019).

The fourth question of the performed interview was instructed to gain data and information to answer the **fourth sub research question**. Insight was gained about real estate and valuation techniques by interviews with real estate agents and valuers. The fourth sub research question that will be answered is:

SQ4. *Which factors may be included in the financial valuation of new residential houses?*

To answer the fourth question an average of the answers is applied: **Approximately 80%** of the participants agree factors influence valuation techniques and requirement. To value new residential houses in ecological neighbourhoods different valuation techniques are applied, sometimes just with practical insights.

Participant real estate agent and valuator Mister R. Boesveld stated: “There are different valuation techniques. In relation with new residential houses of an ecological neighbourhood, the comparison between a traditional house and an eco-dwelling by means of a comparative method is difficult to make, because **2 different houses are never sold at the same time**”. (Translated from Dutch by author, 2019).

Question 4.1 of the performed interview was instructed to gain data and information to answer **sub research question 4.1**. Insight was gained about real estate and valuation techniques by interviews with real estate agents and valuers. Sub research question 4.1 that will be answered is:

SQ4.1. *Which characteristics of the individual houses may be involved in the financial valuation?*

To answer the fifth question an average of the outcome is applied: **Approximately 80%** of the participants believe **technical and social environmental characteristics** influence valuation techniques. Especially real estate agent and valuator of Eggink Maalderink Makelaars, Mister M. Koopmans explained the technical aspects and regulations influencing valuation techniques. An example of calculation of land exploitation traditional residual valuation in the **field research** was sent by Mister M. Koopmans as presented in table 8 and appendix 9.

Participant real estate agent and valuator Mister M. Koopmans stated: “The technical side with the application of durability materials influence valuation techniques, perhaps. In **social cohesion**, the influence on valuation techniques is less. That is too small a part of the market and that was already 20 years ago. That has a small contribution. General measures from The Hague, such as legislation, do contribute to reducing the growing **climate problem**. The training of personnel in the construction sector is also important. If the Small and Middle Enterprises (SMEs) must pay the training, that is complicated. In fact, the government must pay those training courses. Much can still be improved. The cultural envelope that comes in the construction sector. It is still in its infancy. The ecological residential areas are only a small group of people. And for the valuation of dwellings in an ecological residential area, other standards in a dwelling are important. Such as **several rooms** and **additional charges for the general facilities** in an ecological residential area. If there are additional charges at an ecological residential area, then that is sometimes less favorable. It does not provide for example 10% more value than traditional construction. I send an excel file with the calculation of land exploitation traditional residual valuation method by mail.” (Translated from Dutch by author, 2019).

Table 8. Calculation land exploitation traditional residual valuation method (By author, 2019).

ValQ	Scenario extended			Houses
Land exploitations				
Costs		m ²	m ²	
	Purchase area	21256	€ 40,00	€ 850.240,00
	Transfer tax	2	%	€ 17.004,80
	Remediation costs			€ 0,00
	Demolition stalling			€ 250.000,00
	Notary fees purchase	0,003	%	€ 2.550,72
-E9	Purchase costs			€ 1.119.795,52
Construction costs		m ²	€/m ²	€
	Option interest to the owner			€ 0,00
	Urban facilities	21256	0	€ 0,00
	Infrastructure	21256	20	€ 425.120,00
	Commission third	0	0	€ 0,00
-E15	Total			€ 425.120,00
Additional costs		m ²	€/m ²	€
	Change of destination			€ 50.000,00
	Notary fees sales		%	
	Soil research			€ 5.000,00
	Plan damage			€ 0,00
	Archaeological research			€ 0,00
	Environmental research			€ 1.500,00
	Sound research			€ 0,00
	Adventitious			€ 25.000,00
-E25	Total			€ 81.500,00
Interest costs		Period		
	Interest per year	6	%	€
	Purchase costs	6	Year	€ 0,00
	Construction costs	2	Year	€ 0,00
	Fixed owner expenses	0	Year	€ 0,00
	Additional costs	3	Year	€ 0,00
-E32	Total			€ 0,00
Investment				€ 1.843.860,00
Revenue	Houses			€
	40	Houses		
	Lot size	200	m ²	
	Total houses plot	8000	€ 200,00	€ 1.600.000,00
	Per m2 land	€ 245,00	incl BTW	
		0	0	€ 0,00
		0	0	€ 0,00
		0	0	€ 0,00
E43. Total revenue				€ 1.600.000,00
	Uneditable	9000	42,34%	%
Balance ground	=E43-(E9+E15+E25+E32)			-€ 26.415,52

This **ValQ calculation** is a business modeling digital tool that enables an organisation to perform **agile planning** advised by Rijksdienst Voor Ondernemend Nederland (2019a).

The final result in the excel file of appendix 9 is - € 26.415,52 =E43 - (E9+E15+E25+E32). This is the **profit marging** at the bottom of the line. As explained by the participants Mrs. C. Brouwer and Mr. M. Koopmans that is residue, the ground value of the calculation. The investment in **materials, transport costs, processing costs, replacements** and **removal costs** are included in the calculation of the land value. The ground value is lower because of operating costs. This is possible with new buildings. There will not be demolition or disposal costs. The investment costs are not considered.

Question 4.2 of the performed interview was instructed to gain data and information to answer **sub research question 4.2**. Insight was gained about real estate and valuation techniques by interviews with real estate agents and valuers. Sub research question 4.2 that will be answered is:

SQ4.2. *Which characteristics of the location of the houses may be involved in the financial valuation?*

Approximately 70% of the participants mentioned **sustainable characteristics** of the location, which may be involved in the financial valuation. These characteristics are presented in appendix 5, for example: Timber frame construction, shared spaces, hot water housekeeping by solar panels, green environment and EPC standardisation.

Participant valuator Mister A. Bilderbeek stated: “Well, for example the **rent**, what are the costs, **costs of maintenance, insurance, energy charges**, what are the charges? Therein are variables. The burdens are lower, so that the variables of sustainability are better reflected. So, what does a living space cost well per month? Then you get a shift. People then realize that a sustainable home is cheaper. This shift is slowly taking place, especially within the rental sector. So, people don't just think in paying rent, but especially the monthly charges. In this way, a good comparison can be made between traditional homes and sustainable homes. This can then be scored well. And the residual ground value method is mainly intended to appreciate the ground value, not to estimate a property”. (Translated from Dutch by author, 2019).

Question 4.3 of the performed interview was instructed to gain data and information to answer **research question 4.3**. Insight was gained about real estate and valuation techniques by interviews with real estate agents and valuers. Sub research question 4.3 that will be answered is:

SQ4.3. *To what extent is it possible to include the added value of the ecological neighbourhood into the financial valuation?*

Real estate agents and valuers experience **added value** on valuation techniques regarding **new developments of sustainability** in new residential houses of ecological neighbourhoods. **Approximately 75%** of the participants believe **sustainable characteristics** influence valuation techniques positively and have added value into the financial valuation. Based on this research, new residential housing in ecological neighbourhoods sell faster and have a higher market value, especially on the long term.

Participant valuator Mister A. Bilderbeek stated: "The method is only **an instrument to achieve the value**. The value of the dwelling is not determined by the model of course. The market and demand determine the value of the dwellings. The model only remains a method. The location of the house is also decisive. But, the location is multi-part dependent. There is also a lot of overlap. **Energy consumption is lower**. The materials that have been applied are reusable. The interior of the district is greener. For example, by weather conditions water is better absorbed in an ecological residential area. Water can be reused again. An ecological residential area is more circular. And in terms of appearance, the material is used differently from a traditional residential area". (Translated from Dutch by author, 2019).

All results and statements in this chapter are derived from the transcribed interviews, via open coding, axial coding and selective coding specific results were detected. Appendix 10 and table 9 gives an overview of all stages of coding and is a visual summarisation of the results for the **sub main research question** and sub research questions 1 to 4.3 regarding the topic of valuation techniques.

Table 9. Open, axial and selective coding for sub research questions 1 to 4.3 (By author, 2019).

Valuation techniques				
Introduction				
Name	Function	Age	Male or female	Years of services
Mr. M. Muller	CEO, broker and valuator RMT RT MRICS Dynamis Strbosch Thurnissen	Unknown	Male	> 10 years
Future				
1. People		Characteristics of market		Urban area
Het overgrote deel, meer dan 95%, is dat laatste. Dat zijn mensen die denken van; een ecologische woonwijk? Ik heb veel woningen van het project Bo Gro verkocht, dit betreft een reguliere traditionele aannemer.		Ik heb niet de illusie dat de wijk Schuytgraaf met ecologische woonwijk De Kiem in Arnhem, anders is dan een standaard vinex locatie.		Daar zie je ook dat koopwoningen en huurwoningen door elkaar heen bestaan. En daar zie je ook echt een gedachte met gemeenschappelijkheid. En die woningen zijn helemaal circulair gebouwd. Van stro en noem het allemaal maar op ... Daarin zie je een bepaalde gemeenschap ontstaan.
Starting fase	Middle fase	End fase	Persons involved	
Vision and mission	Measuring	Determining	Stakeholders	
2. Urban sustainability		Aim for profit	Valuation method	
Bewoners zich moeten conformeren. Dat was met de bewoners een heel gevecht. Ik ken twee projecten van ecologische woonwijken. Dat is een ecologische woonwijk in Lent bij Nijmegen en ecologische woonwijk De Kiem. In de ecologische woonwijk in Lent zou je je toch even moeten verdiepen. Want, dat is echt doordacht gemaakt. En daar zie je ook, dat is best aardig gedaan.		En daar gaan geen hele hippe duurzame mensen wonen. De ecologische woonwijk / strowijk in Lent bij Nijmegen lewan bestaat al een paar jaar en wordt als voorbeeld ecologische woonwijk gezien. Van hoe je nou een ecologische woonwijk in elkaar zet. Deze wijk vind ik meer een ecologische woonwijk gedachte uitstralen dan ecologische woonwijk De Kiem in Arnhem.	Ik gebruik de comparatieve methode. Ik vergelijk woningen met gangbare objecten in de regio, in dit geval in Arnhem. Natuurlijk zit er in mijn taxatierapport de standaard duurzaamheids paragraaf. Om te kunnen aanleveren bij de bank is de duurzaamheidsparagraaf vereist. Er zijn 10 onderdelen om te beoordeling hoe duurzaam een woning is. Kijk, als ik kijk naar de wijk Schuytgraaf, waar ecologische woonwijk De Kiem ligt, dat zijn allemaal jonge woningen.	
Starting fase	Middle fase	End fase	Persons involved	
Vision and mission	Measuring	Determining	Stakeholders	

6.2 New residential houses in ecological neighbourhoods

In this chapter, the results, data, findings and analysis of the performed interviews about the topic residential houses in ecological neighbourhoods and 4 observations are presented and interpreted according to their suiting research question. Findings and information are, if possible, related to the previously performed literature review and presented in appendix 10.

Sub main research question

Which specific aspects of ecological neighbourhoods influence the value of new residential houses?

To answer the sub main research question an average of the outcome is applied: **Approximately 70%** of the participants agree specific aspects of ecological neighbourhoods influence the value of new residential houses.

Participant architect and developer Mister R. Pijnenborgh stated: "During the building development, a resident unfortunately died. So that house was on sale. The house was **specifically developed** for her, with a dwelling above, where someone could live separately. And that's sold for a **ridiculous price**. The family has sold that very commercially. And fortunately, new people came wich fit in this project. Otherwise, you will not buy property quickly here. The construction decree has become increasingly better in **terms of insulation values**, so the cost of preservation is less high. And the **materials used are just better**, so sometimes cost a little more money. The houses here are really sold with a **high profit**. Brokers do not understand that. They do not understand that ecological construction is more expensive, but at the same time better. And people **pay for quality**. England is far beyond Europe. Old economy thinking needs to change. Remember: **Ecology is economy!** (Translated from Dutch by author, 2019).

The first question of the performed interview was instructed to gain data and information to answer the **first sub research question**. Insight was gained about real estate and valuation techniques by interviews with experts. The first sub research question that will be answered is:

SQ1. *What is the definition of ecological neighbourhoods according to stakeholders?*

To answer the first question an average of the outcome is applied: **Approximately 60%** of the participants mentioned an own definition of ecological neighbourhoods. Recommended by participant Prof. Dr. Ir. Van Hal all participants are asked to their opinion of a definition of ecological neighbourhoods. There is **1 official definition**, nevertheless, because of new developments especially about sustainability, the meaning about ecological neighbourhoods of stakeholders has changed in time.

Participant Prof. Dr. Ir. Van Hal stated: "The definition of an ecological residential area is **very personal**. As far as I am concerned, the definition is **very broad**, because there are also opportunities for me. But, there are also a lot of people who are **narrowing it down to energy**. And those neighborhoods that you mention, I do not know how it is there. I would really make the definition depend on what stakeholders mean. The definition in my research is the **official definition**. It also comes from the **National Environmental Policy Plan**. I did not invent it, it is an idea from the National Environmental Policy Plan Plus, from the annex to sustainable construction. And that was the vision of sustainable building at the time. But, that definition has changed over time. Everyone gives their **own interpretation**. There is no official definition. So, it is important to find out what people understand. Whether there is a **relationship** with the broad definition". (Translated from Dutch by author, 2019).

The second question of the performed interview was instructed to gain data and information to answer the **second sub research question**. Insight was gained about ecological neighbourhoods by interviews with experts and observations presented in appendices 5 and 10. The second sub research question that will be answered is:

SQ2. *What are the advantages and disadvantages of new residential houses located in ecological neighbourhoods compared to similar properties in traditional ecological neighbourhoods?*

To answer the second question an average of the outcome is applied: **Approximately 70%** of the participants mentioned advantages and disadvantages of ecological neighbourhoods. Participants also agreed on the possibility of benchmarking between different ecological neighbourhoods. All participants explain advantages and disadvantages of ecological neighbourhoods. In relation to the focus of this Master Thesis, valuation techniques, the information of tutor Asset Management and valuator Mrs. C. Brouwer is very useful. Nevertheless, summarised **the technical sustainable elements** of ecological neighbourhoods by observation presented in appendix 5 are important advantages **in relation to valuation techniques**.

Participant tutor Asset Management Saxion MFREM and valuator Mrs. C. Brouwer stated: "Certainly it is useful to describe the advantages and disadvantages of houses in an ecological residential area. If an ecological residential area is an **attractive area, the land price can be higher**. Which gives the house a higher price? But, if the ground is also larger, for example, 5 square meters because there is a Greenhouse, then a house will soon be worth € 50,000.00 more. I should research this, looking at the differences in the houses of an ecological residential area. There will be a group of people who want to go back to the basics of living. At residual, you will see what the investment is, such as pillowcases and everything that comes within. And what proceeds does that yield?" (Translated from Dutch by author, 2019).

The third question of the performed interview was instructed to gain data and information to answer the **third sub research question**. Insight was gained about ecological neighbourhoods by interviews with experts and observations presented in appendices 5 and 10. The third sub research question that will be answered is:

SQ3. *What are the typical characteristics of residential houses located in ecological neighbourhoods?*

To answer the third question an average of the outcome is applied: **Approximately 70%** of the participants support ecological neighbourhoods because of the **typical characteristics** presented in appendix 5. Participants such as Prof. Dr. Ir. A. Van Hal, mister P. Brouwer, mister F. Westdorp, mister M. Koopmans and mister R. Pijnenborgh advised me to select the following 4 ecological neighbourhoods: E.V.A. Lanxmeer Culemborg, De Kiem Arnhem, Woonderij EOS Zutphen, and BWWB 's Hertogenbosch. This means a **comparison or benchmark** (Black, Akintoye and Fitzgerald, 2000) can be made about **new** ecological neighbourhoods and "**older**" ecological neighbourhoods.

Participant architect and developer Mister P. Brouwer stated: "You will also have an interview with Joyce van den Hoek-Ostende. Joyce is in favor of 1 **business model** and better collaboration of parties. In a European project, Joyce is conducting research on collaboration in construction. How will this collaboration be achieved, as Van Hal (2009) advises? Joyce will tell more about the collaboration. Although it is only a joint purchase of construction products. The sale of the houses in the ecological neighbourhood De Kiem is still in progress. There are several speeds in the construction of the ecological neighbourhood De Kiem. This makes joint purchasing a big problem. There was little enthusiasm to discuss each other, everybody is doing his own thing." (Translated from Dutch by author, 2019).

All results and statements in this chapter are derived from the transcribed interviews, via open coding, axial coding and selective coding specific results were detected. Appendix 10 and table 10 gives an overview of all stages of coding and is a visual summarisation of the results for the **sub main research question** and sub research questions 1 to 3 regarding the topic of new residential houses in ecological neighbourhoods.

Table 10. Open, axial and selective coding for sub research questions 1 to 3 (By author, 2019).

Dutch ecological neighbourhoods				
Introduction				
Name	Function	Age	Male or female	Years of services
Prof. Dr. Ir. Mrs. A. van Hal	Professor sustainable building & development of Nyenrode Business Universiteit at Breukelen.	Unknown	Female	30 years
1. Commitment to collaboration		Transparency	Governance	
Ja precies, lessen uit het verleden dat gaat over ecologische woonwijken in de jaren '90. Hmm even kijken. Ik ben ruim 30 jaar actief binnen duurzaam bouwen. Maar ik ben tot de conclusie gekomen, mijn collega's en ik samen door de jaren heen, dat je alleen maar duurzaamheid voor elkaar krijgt als milieumaatregelen aansluiten op wat mensen echt graag willen. Tenzij je het afdwingt. Als je niet afdwingt, dan zal je kunnen zoeken naar de aansluiting waar mensen mee bezig zijn.		Omdat je dan, dan ga je het echt willen. En als je het gaat willen dan heb je nog steeds geen geld om het toen, maar dan heb je wel de wil om het voor elkaar te krijgen. En daarmee ga je dan ook heel anders om met financiën. Dan word je creatiever dan wanneer je denkt ik moet het doen van de overheid, maar het is eigenlijk niet je eigen keuze dan baal je ervan.	En als je het echt heel graag wil, dan is het een hele andere dynamiek. Dat is wat er speelt in fusie van belangen. Je moet eerst weten wat de belangen van de mensen zijn in de breedste zin, vervolgens ga met je kennis over duurzaamheidsmaatregelen die belangen behartigen.	
Starting fase	Middle fase	End fase		Persons involved
Vision and mission	Measuring	Determining		Stakeholders
2. Trust		Growing certainty	Risk	
Weet je, de definitie van een ecologische woonwijk is heel persoonlijk. Degene die er mee bezig zijn wat zij eronder verstaan bepaalt voor die wijk wat een ecologische woonwijk is. Wat mij betreft is de definitie heel breed, omdat daar voor mij ook kansen liggen. Maar, er zijn ook heel veel mensen die verengen het tot energie.		Of er een relatie is met de brede definitie. Want, wat leuk is te vertellen. Die ecologische woonwijken, ik weet niet of dat in het rapport staat, de Europese commissie die in 1987 onder leiding stond van mevrouw Brundland, die premier van Noorwegen (vandaar het Brundland rapport) lanceerde het begrip duurzame ontwikkeling (Our common future heet dit rapport).	En die wijken die jij noemt, ik weet niet hoe het daar is. Ik zou echt de definitie laten afhangen van wat zij eronder verstaan. De definitie in lessen van vroeger is echt de officiële definitie. Die komt ook uit het nationaal milieubeleidsplan. Die heb ik niet verzonnen, die komt voort uit het nationaal milieubeleidsplan plus, uit de bijlage	

6.3 Findings and analysis in relation to the theory

Interpretivism is used in this research. The opinions from experts will be interpreted and compared. Analysis of the interviews with the experts by **interpretive approach** focuses on the selected following topics presented in appendix 8:

TREE DIAGRAM I	Traditional valuation techniques advantages
TREE DIAGRAM II	Traditional valuation techniques disadvantages
TREE DIAGRAM III	Advanced valuation techniques advantages
TREE DIAGRAM IV	Advanced valuation techniques disadvantages

The interviews with experts explain relation to adding value of Corporate real estate management (**CREM**) to projects of new residential houses in ecological neighbourhoods and its stakeholders (Lindholm and Leväinen, 2006). CREM has gradually shifted from primarily steering on cost reduction towards managing of CREM as a strategic resource. The added values of CREM in main tree diagram in appendix 10, for example, are **process**, **economy** and **surrounding** as a comparison of parameters of CREM value adding.

For this research that **specific purpose** is finding ecological neighbourhoods and real estate agents who value residential properties in these specific locations. This specific purpose is accomplished by interviewing the selected participants. Participants describe disadvantages of the described traditional valuation techniques such as **lack of collaborative skills**, traditional thinking or fear of failure. The advantages mentioned by the participants are **simple methods**, **flexibility to change** and **transparency**. The advantages and disadvantages are illustrated in tree diagram in appendices 8 and 10.

Determining financing valuation with suitable valuation techniques for new residential houses in ecological neighbourhoods is possible, applying the latest novelties like the **digital tool** "Energy saving explorer for professionals", **green accounting** and **blockchain using the quantitative comparative approach** by Yeh and Hsu (2018). Besides improvement of valuation techniques, improvement of collaboration in the construction sector is also needed, according to participant Van Hal (2009). Creating sustainable houses with increased **market value** for valuation. Collaboration is considered as an influential contractual relationship in CREM that brings **sustainable benefits** to stakeholders in the construction sector. **Sharing risks** and losses, **reduced risk exposure**, innovation, better cost management, and increased market shares are the most common benefits of collaboration.

7 Discussion

7.1 Discussion on research limitation

There are 2 **types of limitations** within a case study: Limitations by time, place and activity and limitation by definitions and context (Baxter and Jack, 2010).

7.1.1 Limitation by time, place and activity

At first, there are 2 sorts of studies: Cross-sectional studies and longitudinal studies. In **cross-sectional studies**, the research exists of a snapshot at a particular time. **Longitudinal studies** have a much longer time-frame to do research. Most studies, including this 1, are time constrained and therefore cross-sectional. Further, due to time limitation, not all ecological neighbourhoods can be included.

Four ecological neighbourhoods participate in this study. The observations will exist in a snapshot because it is not possible to repeat the observations in the given time for this research (Saunders et al., 2012).

7.1.2 Limitations by scope and context

Limitations by definitions are described in paragraph 7.2. Within a case study it is important to mention the limitations of breath and depth (Baxter and Jack, 2010). The breath of this study is determined by 4 ecological neighbourhoods that have sustainable applications and suitable valuation techniques. The depth of this study is determined by 3 types of data collection: 15 interviews, 4 observations and deskresearch.

Furthermore, the target group must be defined. Ecological neighbourhoods have multiple stakeholders, according to Van Hal (2016). Groups connected with ecological neighbourhoods and valuation techniques are selected: Real estate agents-/ valuers and developers. Therefore, these are the target groups of this study. At last, because this study is an academic study, the study ends with recommendations for suitable valuation techniques of ecological neighbourhoods. The implementation of the recommendations will not be discussed.

The scope of the present research is limited in multiple ways:

- (1) **Geographical scope** is limited to the Netherlands, and within the country to 4 specific neighbourhoods, as case studies. This means that conclusions made are limited to Dutch context, and to the types of locations involved in the study (urban, mid size towns).
- (2) **Ecological neighbourhoods** are “residential area, developed by integrated urban planning regarding ecological, sustainable, social and technical aspects, which are built in line with national sustainable policy measures” (Van Hal, 2016, p.12). Other types of neighbourhoods are involved in the study for comparison, the main focus is to find information for the ecological neighbourhoods, to see what differentiates them from traditional ones.
- (3) **Residential properties**: The study focuses only on residential houses, does not deal with commercial buildings.
- (4) **New properties** with first time owners.
- (5) The study focuses on 1 specific valuation moment. **Valuation moments** in the building process are the times when the value for the financing can be determined (De Wild, 2010). Three phases may be differentiated, as strategic (gestation), preparatory (growth) and **realisation phase** (maturity) (Portilla, 2019). In the present study only the final, realisation phase will be considered, as the process of construction is out of the scope of the research.
- (6) The types of valuation techniques involved in the study are limited to a specific set of techniques, **as advanced and traditional valuation techniques**.
- (7) The **variables** involved in the valuation are limited partially due to the valuation techniques chosen and partially due to the interviews.

7.2 Discussion on definitions

This paragraph describes relevant definitions for this study. The definitions are an explanation of the content of the terms used in this specific study.

According to Ten Have (2007a) the definition of **real estate** is "a property that exists independently of other objects and is separately identifiable as such" (p.162). Roodhof (2012, p.33) and Portilla (2019) describe real estate as "an illiquid business where long processes with uncertainty are prevalent".

Pagourtzi et al., (2003) explains **valuation techniques** as "valuation, in its simplest form, is the determination of the amount for which the property will transact on a particular date. Valuation techniques can be grouped as **traditional and advanced**" (p. 383). Roodhof (2012) states that traditional "valuation techniques are appraising the investments, if companies that make these investments are not capable of changing the project course, as a response to continuing new insights" (p.31).

The **financing valuation** stated as **mortgage lending value** described by Ten Have (2007b) is:

The mortgage lending value is the value of a property item established by a valuator based on a cautious forecast of the future marketability of the property, taking sustainable long-term aspects of the property, normal and local market conditions, the use made of the property at that time and any other purposes for which it is suitable and where speculative factors may not be in the settled mortgage lending value, into account (p.37).

Green accounting has been defined by Moorty and Jacob (2012) as: "The identification, tracking, analysis, and reporting of the materials and cost information associated with the environmental aspects of an organisation" (p.4).

According to Van Hal (2016), **ecological neighbourhoods** are "residential area, developed by integrated sustainable urban planning, regarding ecological, **social and technical characteristics**, which are built in line with national sustainable policy measures" (p.12).

Van Timmeren et al., (2007) describe ecological neighbourhoods as:

The outcomes of extra-ordinary private initiatives supported by dedicated local authorities. Its origin lies in the establishment of **integrated sustainable urban planning**. This leads to the creation of unique ecological neighbourhoods where highly committed residents live and work in human- and environmentally-friendly environment. (p.1)

7.3 Discussion on research methods

According to Baker and Edwards (2012), a sample of interviews consists of **12 interviews for valid research**.

The research questions and sub-questions could be answered successfully by conduction **interviews** with experts and 4 observations combined with existing research of RICS (2019), De Wild (2010), Van Hal (2016), Roodhof (2012) and Van Timmeren (2008). Opinions of participants did differ in such a manner that more interviews provided a better in-depth insight into various opinions of participants. The purposes method of sampling worked therefore very well and provided relevant information to answer the research questions. Semi-structured interviews gain a better understanding of the perspective of the participants, which is important in a relatively new study like this (Baskarada, 2014).

The interviews with stakeholders of ecological neighbourhoods were first needed, to achieve the **right academic source** like **Professor, Dr. Ir. Mrs. A. Van Hal**. Appointments were already made in December 2018. After available information, the interviews with **stakeholders** and **experts of valuation techniques, like real estate agents** and **valuators** suited better. As advised by Saxion tutor **Dr. A. Eros (Mrs.)**, most important and selected participants connected with valuation techniques are presented in table 7.

As aforementioned the sample size is relatively small, based only on **stakeholders with expertise on valuation** of 4 selected ecological neighbourhoods, and **new knowledge of developments on sustainability** within the real estate industry (Portilla, 2019). This is typical to casestudies, nevertheless, a larger sample size and more participants would have improved the reliability of the study. To improve the reliability of the research, the interviews are recorded and transcribed.

To balance the duration of the interviews with in-depth and qualitative information, the duration of an average of **45 - 60 minutes per interview** was chosen to avoid redundancy of data. It was not particularly obvious in the first interview that a longer duration would weaken the information stream and authentic aspect of the interview. Sometimes a longer duration led to repeated answers.

Nevertheless, the latter might confirm the authentic aspect of the participant while the repeated answers can be checked for **stability** and **variety**. However, an average of 45 - 60 minutes appeared to be enough to retrieve qualitative data. Furthermore, after the 8th interview, it appeared that new information still was being gathered. Therefore, an extension of the sample with experts like **Prof. Dr. Ir. A. Mr. van Timmeren** (2008) of the Technical University of Delft and experts of the Technical University of Eindhoven, **RICS** (2019) and **Associate Prof. Mr. J. Portilla** (2019) of IE business school of real estate developments have improved the **in-depth quality** of the information.

During the interviews, the researcher did not get the impression that individuals did know each other that well or that specific political backgrounds have affected the interview outcome (internal validity). Transcripts are **completely objective, original, authentic**, diverse and contain valuable and different information for each participant for example size, location or variables of the new residential houses in ecological neighbourhoods (external validity).

The interviews are coded in Dutch. Various Dutch statements of interviewees were translated into English applied in this Master Thesis. Due to time constraints, it appeared impossible to verify the **true meaning** of the English translations with the original meaning expressed by the interviewees or to translate them back into Dutch by a professional translator for verification. **Translation bias cannot be excluded** and might have affected construct validity.

The author as a researcher performed transcribing and coding of the interviews. Reliability of the findings might have improved if **more than 1 researcher** would have been involved in the coding of the transcribed data set. Nevertheless, the agreement between 'researchers' in terms of reliability cannot be discussed. The latter, was not discussed or required as such during the proposal stages of this study and is therefore not taken into account. It is believed that the coding tables of appendix 10 provide **sufficient transparency, transferability, and reproducibility** that reliability doesn't need to be questioned as such. The research as such is reproducible and therefore valid.

A limited amount of time was available to perform this research. Because planning, conducting and transcribing semi-structured interviews consumes much time, the research is limited to a **hard maximum of 15 interviews**. Conducting interviews of an average of 45 - 60 minutes per interview combined with 4 observations and existing research of RICS (2019), Portilla (2019), De Wild (2010), Van Hal (2016), Roodhof (2012), Van Timmeren et al., (2007) and Van Timmeren (2008) produced enough data and enabled answering the main research question and sub-research questions but might have limited the possibility of exploring additional related variables, topics or themes.

Further, due to time limitation, not all ecological neighbourhoods can be included. Four ecological neighbourhoods participate in this study. Ecological neighbourhoods are selected based **on advice** of Professor, Dr. Ir. Mrs. A. Van Hal (2016). There are 2 existing ecological neighbourhoods of **approximately 20 years old**. And 2 new and **under construction ecological neighbourhoods**. A benchmark between existing and new ecological neighbourhoods will be made. The observations will exist of a snapshot, because it is not possible to repeat the observations in the given time for this research (Saunders et al., 2012).

8 Conclusion

8.1 Traditional valuation techniques

When a value is granted to 5 characteristics of the **traditional valuation techniques** the matrix as shown in table 11 exists according to De Wild (2010), Roodhof (2012), (Yeh and Hsu, 2018) and is explained below:

Table 11. Matrix suitable traditional valuation techniques by author (2019).

Characteristics	1. Comparative approach methods	2. Cost approach methods	3. Income approach methods
1. Reliable	Y	X	Y
2. Conservative			
3. Transparent			
4. Speed			
5. Risk-analysis			

X = Undesired valuation technique

Y = Desired suitable valuation technique

The following columns will display the traditional valuation methods that are examined. For each method, **a qualification** is given based on the study of Roodhof (2012), De Wild (2010) and RICS (2019) to what extent the method satisfies the properties that the valuation method must meet. Comparative approach methods generally fits in best with the properties that a valuation of the financing requires. It can be concluded, that the traditional residual valuation method within the comparative approach methods, is the most appropriate method, to determine a financing value of new residential houses in ecological neighbourhoods.

Comparative methods are the **most reliable** and **conservative**. Comparative methods causes reliability, because the value is achieved by reliable direct market comparison. **The residual method within comparative approach methods** has the least subjectively to estimate and sensitive variables, which benefits the reliability. The sensitivity of the **subjective variables**, if there are any houses intended for sale, is the lowest in the comparative approach method.

In the latter case, the methodology seems to be the most appropriate method for determining the financing value of new residential houses in ecological neighbourhoods. However, the difference between the residual valuation method is minimal. Although comparative methods are **reliable**, it is not immediately the most predictable. Comparative approach methods are **transparent**. This is caused by the **simplicity** and the well-to-follow sequence of the calculation as well as the traceability of the variables. When the cash flows "fall" is exactly clear. However, this transparency is negated by the subjective estimation of the discount rate. For new residential houses in ecological neighbourhoods, a **database** within **blockchain** (RICS, 2019) should be created to gain insight into the storage in the discount rate. If this is achieved through transparency, the **residual valuation method** for new residential houses in ecological neighbourhoods, is the most appropriate.

As far as **speed** is concerned, the simplest calculation, the **comparative method within comparative methods**, is the **fastest**. Followed by the **residual valuation method** within comparative methods. The method of using the methodology is always at the right time to put the cash flows into reality and time-consuming. This will be returned to each rating separately, making the method less suitable for new residential houses in ecological neighbourhoods. New residential houses in ecological neighbourhoods can be built as a project applying a business model related to FREM. Projects often have different timing times when cash flows occur.

The least reliable is the **Real Options Theory (ROA)** within comparative methods. This method in the research has a high sensitivity of the **subjective variables** to be estimated. Nevertheless, **risk-analysis** is well possible within the ROA theory. Roodhof (2012) explains the ROA theory as follows:

When someone buys an option, he buys the right to engage in that transaction. The seller incurs the corresponding obligation to fulfill the transaction. An option which conveys the right to buy something at a specific price is a call option. (p.18)

The preparation of the ROA theory within comparative methods calculation requires the most time. The calculation of the ROA theory within comparative methods is opaque. Once placed in a spreadsheet as Excel the calculation will be used for several projects. This means that the ROA theory within comparative methods is almost as fast as the comparative method.

Because traditional valuation methods are **not fully capable** of answering the main question of this research, a look at **alternative methods** must be taken (Yeh and Hsu, 2018). At this moment, according to De Wild (2010) the most appropriate and flexible method for determining the financing value of the new residential houses in ecological neighbourhoods is the residual valuation method within comparative approach methods combined with the **digital tool** the "Energy saving explorer for professionals" as presented in appendix 9.

8.2. Advanced valuation techniques

When a value is granted to 5 characteristics of the **advanced valuation techniques** the matrix as shown in table 12 exists according to the De Wild (2010), (Yeh and Hsu, 2018) and is explained below:

Table 12. Matrix suitable advanced valuation techniques by author (2019).

Characteristics	1. HPM	2. ANNs	3. ARIMA
1. Reliable	Y	X	X
2. Conservative			
3. Transparent			
4. Speed			
5. Risk-analysis			

X = Undesired valuation technique

Y = Desired suitable valuation technique

According to Yeh and Hsu (2018) the **HPM** is an advanced valuation technique of the quantitative method of the comparative approach. In comparison to the traditional valuation techniques, advanced valuation techniques are **not conservative**. Because the price of real estate is estimated by the **regression model**, it does not have the human bias which often happens in the conventional comparative approach.

Furthermore, the regression model presented in appendix 9 can decrease the appraisal cost, but it cannot handle the factors difficult to quantise. So, the HPM is often used by the industry to deal with the **mass appraisal of real estate**. It is also used by the **academies** to play the role of **benchmark** to evaluate other approaches. Compared with comparative approach, its **main disadvantage** is that it cannot provide real comparative cases for appraisers to value real estate price.

The HPM uses not only the regression analysis, but also **ANNs** or **other artificial intelligence approaches** like **ARIMA** to establish the estimated price models of real estate. For example, a sample of 2.694 residential properties was employed to compare geostatistical approach, ANNs model, and the traditional linear HPM for mass appraisal valuation accuracy. The findings demonstrate that ANNs can be shown to perform very well in terms of **predictive power**, and therefore **valuation accuracy**, **transparency** and **reliability** outperforming the traditional multiple regression analysis and approaching the performance of spatially weighted regression approach (Yeh and Hsu, 2018).

However, ANNs retain a '**black box**' architecture that limits their usefulness to practitioners in the field. And as far as **speed** and **risk-analysis** is concerned, not much information is available, as not much practitioners in the field experienced advanced valuation techniques (Yeh and Hsu, 2018).

The purpose of this thesis project is to propose an innovative real estate valuation technique approach, so that it overcomes the **shortages of lack of calculating sustainable variables** at the traditional comparison valuation techniques. The **independent sustainable variables** are presented in appendix 9. The main **advantage** of conventional traditional comparative approach is that it can provide real comparative cases for appraisers to value real estate price. In practice, comparative cases from real market trading are very important to persuade traders to **accept the appraisal price**. The main **disadvantage** of conventional comparative approach is that the correction coefficients often rely on the appraisers' subjective evaluation.

The empirical results of Yeh and Hsu (2018) show that the quantitative comparative approach is **more accurate** than the 2 classical HPM-approaches, multivariate regression analysis and ANNs. The approach advised by Yeh and Hsu (2018) combined with implementing the latest novelties like **the digital tool, green accounting** and **blockchain** introduced by RICS (2019) can keep the main advantage and avoid the main disadvantage of conventional comparative approach.

There is a **relationship** between urban environment like ecological neighbourhoods and real estate valuation techniques. The relation is based on existing research and the matrix of the suitable valuation techniques determining financing valuation for new residential houses in ecological neighbourhoods as described above are visualised in figures 11, 12, appendices 6 and 7.

8.3 Ecological neighbourhoods

The background of this research is urban planning for cities that is based on interconnection, as well as **waste management** in general and on closure of the essential cycles, energy and water inside urban developments, or as close to them as possible by new residential houses in ecological neighbourhoods. It is important to change the **general attitude** towards the different components of design, development, use and management of urban areas. A way for doing this is the 'interconnection' of different themes and cycles within cities as explained by Van Timmeren et al., (2007).

According to Van Timmeren et al., (2007) an example is the linking of sanitation to energy- and food production, preferably at lower scale levels. The introduction of solutions on an intermediate scale-level, like ecological neighbourhood E.V.A. Lanxmeer Culemborg, offers opportunities for autonomous design of the whole or elaborations in which buildings can be semi-autonomous. Introducing the analogy of the functioning of buildings with respect to energy and sanitation flows with that of a parasite. The appealing-, and already partly realised, example of the linking of agriculture, waste water treatment and energy production in the urban district E.V.A. Lanxmeer in Culemborg might be exemplary for the potentials of the supposed need for a change in attitude.

Urban flexibility for buildings and infrastructures is a pre-condition for anticipating long-term uncertainties as explained by Van Timmeren (2008). Sustainable starting-points like new residential houses in ecological neighbourhoods are suppressed more and more by these changes. However, at the same time especially the intermediate scales can start up the necessary process of transformation towards real sustainable development, for it takes the best of 2 worlds.

At present however, technical infrastructures still are leading to urban development, often even to the suprastructure of society. The **strategically** or even random integration of decentralised clusters which preferably approach **sustainable generated autonomy** in interconnected centralised networks will help to improve the resilience, flexibility, security and sustainability of the overall network. At present mostly only the dependence of decentralized systems on centralized systems -in general for reasons of storage and/or backup- have been put forward. However, especially in case of ongoing interconnection, centralization and liberalization, both future paths for sustainable development, the 'economies of scale' and the 'scale economy', or "autonomy" and "heteronomy" need 1 another mutually. Apart from that, the issue of a more precise attribution of costs to specific customers or transactions (which becomes more and more important as complexity decreases with ongoing liberalisation) may be solved or may easier be solved.

The postulated changed urban planning and related network philosophy in this is the **cascading use of resources**, where high-grade flows are used in high-grade processes and residual waste flows are used in lower-grade processes, thus making the most efficient use of the initial value of a resource. This so called low exergy approach taken here is inspired by the urban metabolism based on natural ecosystems, where processes run on the available usually low exergy resource flows. This approach is thus in line with the **Industrial Ecology** and regenerative design thinking of taking nature as a role model (RICS, 2019).

Van Timmeren (2008) concludes that low exergy design and **ecological approaches** can strengthen the systems, methods and tools used for organizing, operating and supervising the urban environment and will minimize the negative impacts of urban areas on ecological cycles at all levels, creating efficient urban systems and livable cities. **A life-cycle approach** and planning based on 'place-making' is mandatory here in order to capture all relevant environmental effects to ensure an overall optimisation of resource use at all times.

Regarding the aforementioned information the **added value** of new residential houses in ecological neighbourhoods **for FREM** in concrete terms is as follows:

- Different way of valuation
- Different business model
- Promoting by marketing and sales
- New type of work in construction sector
- New jobs in construction sector
- New knowledge in construction sector
- Better indoor climate and comfort of houses
- Reducing real estate related costs
- Reducing of primary resource consumption
- Reusing or recycling materials and
- Reducing construction and demolition of waste.

8.4 Answering the main research question

The main research question is:

Which financing valuation techniques are suitable for new residential houses in ecological neighbourhoods?

To answer this question this study elaborated on developments in the construction sector, such as sustainability. The most famous definition of sustainability of the UN Commission Brundtland from 1987 proposes sustainable development as a development that meets the needs of the present without compromising the ability of future generations to meet their own needs without danger (De Bruijn, 2018).

For projects of new residential houses and urban planning Van Hal (2016) advises a **broadening of sustainability** on 5 fronts:

1	Broadening the definition of sustainability
2	Broadening the focus of home to living environment
3	Broadening the look at interests
4	Broadening the look at disciplines
5	Broadening in time

In relation to promote investments in sustainability for **urban planning in cities** such as new residential houses in ecological neighbourhoods the main research question will be answered. Funding is initially offered only for financing projects like new residential houses in ecological neighbourhoods, which should initially be feasible. If a project shows a negative result in a deterministic period and by a ROA theory a positive result is given, the financier will respond reluctantly. It is possible to apply subjective valuation into all valuation methods (RICS, 2019).

For this research a **specific purpose** is accomplished by finding ecological neighbourhoods and real estate agents who value residential properties in these specific locations. Determining the financing valuation with suitable valuation techniques for new residential houses in ecological neighbourhoods is possible, applying the latest novelties like the **digital tool** "Energy saving explorer for professionals", **green accounting** and **blockchain using the quantitative comparative approach** by Yeh and Hsu (2018). Therefore, it can be concluded there is a **relation** between suitable real estate valuation techniques determining financing valuation and new residential houses in ecological neighbourhoods.

The most logical idea is to apply the current valuation technique, which is best suited for determining the financing valuation for new residential houses in ecological neighbourhoods, such as the most suitable residual valuation method as presented in the conclusion of figure 13.

By implementing the most suitable **residual valuation method** combined with the latest novelties like the **digital tool** “Energy saving explorer for professionals”, **green accounting** and **blockchain** by **quantitative comparative approach** of Yeh and Hsu (2018) in projects for new residential houses in ecological neighbourhoods, the relevance of the investment is made clear.

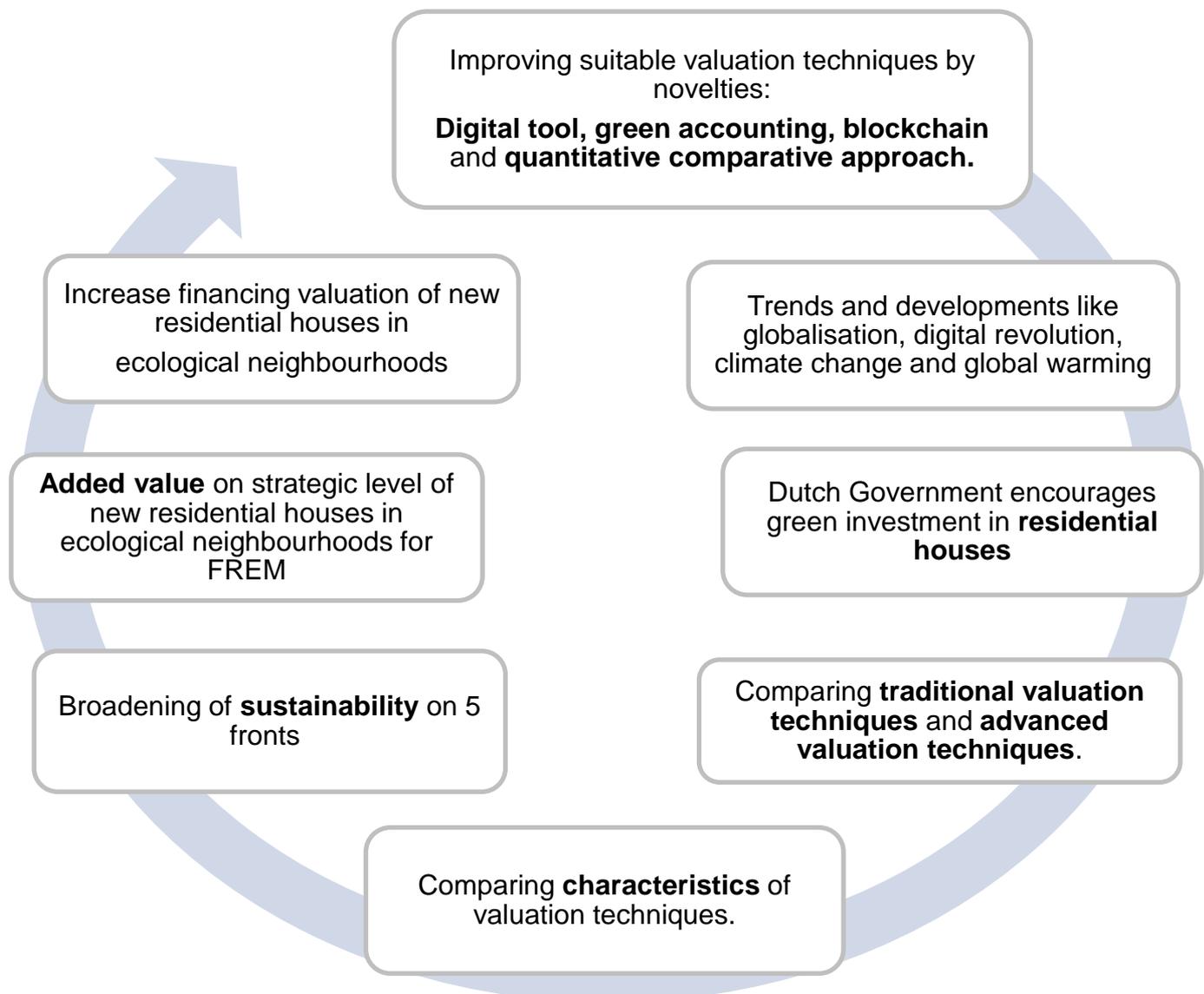


Figure 13. Conclusion of this research in a scheme (By author, 2019).

9 Recommendations

9.1 Recommendations on a strategic level

Suitable valuation techniques for residential houses in ecological neighbourhoods is a relatively new **FREM-topic**. New residential houses in ecological neighbourhoods can be built as a project applying a business model related to FREM. It is related to reducing costs, improving the value of assets, support image, **stimulate innovations**, **sustainability** and creating a healing environment. A way to achieve suitable valuation techniques for residential houses in ecological neighbourhoods on a **strategic level** is by making use of the **added values**.

According to Prevosth and van der Voordt (2011), there are 11 added values on a strategic level, namely:

1	Reducing cost
2	Improve productivity
3	Improve user satisfaction
4	Improve the value of assets
5	Improve flexibility
6	Support image
7	Stimulate innovations
8	Support culture
9	Risk-management
10	Sustainability and
11	Creating a healing environment

The combination of the results of this study and the added values ensures recommendations on a **strategic level**. This ensures that this study should have focused on both Facility Management and Real Estate Management. The research has illustrated that the environment in the construction sector and sustainability influence real estate valuation techniques. These aspects are related to Facility Management and Real Estate Management.

As aforementioned new residential houses in ecological neighbourhoods are build as a project applying a **business model related to FREM**. Initially, the behavior aspects of collaboration in the construction sector are related to Facility Management, namely leadership, organisational culture, and strategy. The **strategy** of an organisation determines the way in which processes are performed, for example, the way how collaboration is applied in the construction sector. The organisational culture and leadership styles determine the working atmosphere in the construction sector, which could mean that this can not only have a positive effect on employee behavior in the construction sector, but it could also be a negative effect on motivation. The real estate aspect of valuation techniques is related to Facility Management. It determines the strategy of the **construction sector**. Offered **amenities in residential houses** in ecological neighbourhoods and sustainable facilities are a conscious choice based on the strategy.

9.2 Recommendations on the industry level

The real estate market industry has gained relative bad media attention in the last few years. The real estate market industry still has not got the image that it would like to have. The market is not seen as a transparent and healthy market (Portilla, 2019). This is in contrast with changes in society these days. In social terms, **transparency and integrity** are becoming more important every day in every branch of society. Seen from a social point of view, this **academic research** is improving the transparency of the real estate market (RICS, 2019).

The most appropriate valuation technique for determining the financing value of new residential houses in ecological neighbourhoods is the **residual valuation method**. A calculation example of this is discussed by the real estate agent and Valuator Mister M. Koopmans of Eggink Maalderink Makelaars Zutphen as presented in table 7 and appendix 9. Because of developments like sustainability for the industry of real estates such as real estate agents, developers and valuers the residual valuation method is a recommendation. To find an even better connection to the measurement moments of chapter 2, the **residual valuation model** could be adjusted better in time. This allows the digital tool the "Energy saving explorer for professionals" to be applied. The digital tool "Energy saving explorer for professionals" provides insight quick and easy into possibilities and illustrates the effects of energy-saving measures on power costs and the energetic quality of houses (Rijksdienst Voor Ondernemend Nederland, 2019a). In addition, deductions for profit and risk could be considered, so an amount as a subjective estimation of profit for the destination risk could be deducted.

9.3 Recommendations related to FREM

Finally, the **environmental aspect** of new residential houses in ecological neighbourhoods is related to both Facility Management and Real Estate Management. The aspects of building characteristics and location in the common area are Real Estate related. The Real Estate part is in this case focus on the combination between the corporate strategy and the real estate strategy for real estate agents and valuers. As new residential houses in ecological neighbourhoods can be built as a project applying a **business model related to FREM**.

Therefore, it could be concluded that most aspects are focusing on Real Estate Management. This implies that it could be helpful for building new residential houses in ecological neighbourhoods taking into account a **businessmodel** with human resource management, leadership style, organisational culture, organisation strategy and real estate strategy by improving **sustainability**, collaboration in the construction sector. Creating sustainable houses with increased **market value** for valuation. Applying the most suitable valuation technique **traditional residual method** combined with latest novelties like the **digital tool** “Energy saving explorer for professionals”, **green accounting** and **blockchain** by **quantitative comparative approach**.

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Appendices

Appendix 1. List of abbreviations

Table 14. Analysis abbreviations in this Master Thesis (By author, 2019).

Sources used for all abbreviations are presented in the reference list. See reference list for more details.	
ANNs	Artificial neural networks
BENG	Almost energy neutral building
BWVB	Conscious Living, Working, Boschveld
CBRE	CB Richard Ellis
CO ₂	Carbon dioxide
CREM	Corporate and Real Estate Management
DCF	Discounted Cash-Flow (DCF) is a valuation method used to estimate the attractiveness of an investment opportunity.
EOS	A Greek goddess: Bringer of the early light in the morning
EPC	Energy Performance Coëfficiënt
E.V.A.	Ecological Centre for Education, Information and Advice
IE	Instituto de Empresa, Business School
JLL	Jones Lang LaSalle
FM	Facility Management
FREM	Facility and Real Estate Management
HPM	Hedonic pricing method
MFREM	Master Facility and Real Estate Management
MRED	Master of Real Estate Developments
M ²	Square metre, A unit of area
RICS	Royal Institution of Chartered Surveyors
SE	Selling expenses
SMEs	Small and Middle Enterprices
ROA	Real Options Theory
ValQ	A business modeling digital tool that enables an organisation to perform agile planning.
YIELD	To supply or produce something positive such as a profit.
ZEB	Zero Energy Building

Appendix 2. Interview questions

Introductie:

Allereerst ontzettend bedankt dat u mij te woord wilt staan. U bent ... Ik ben Yvonne Schuijt, student aan Saxion MFREM. Ik richt mij op passende waarderingstechnieken met betrekking tot vastgoed van particuliere woningen in Nederlandse ecologische woonwijken, bekeken vanuit het oogpunt van betrokken belanghebbenden. Van u verneem ik graag uw onafhankelijke expertise op het gebied van waarderingstechnieken van vastgoed en duurzaamheid.

Verdiepingsvragen:

Nederlandse ecologische woonwijken:

1. Wat onderscheidt de bouw van ecologische woonwijken van de reguliere bouw, volgens u?
2. Kan de bouw van ecologische woonwijken worden vergeleken (benchmark) met de reguliere bouw?
3. Zo ja, welke verschillen zijn hierbij vast te stellen?
4. Volgens Van Hal (2009) kan de samenwerking binnen de reguliere bouw nog veel worden verbeterd. Wat vindt u van de huidige samenwerking binnen de reguliere bouw?

Stedelijke duurzaamheid:

5. Zijn de ontwikkelingen van duurzaamheid bij de bouw van een ecologische woonwijken veranderd ten opzichte van de huidige ecologische woonwijken?
6. Aan welke voorwaarden moet duurzaamheid voldoen bij het bouwen van een ecologische woonwijken, volgens u?
7. Zijn er financiële prikkels om duurzaamheid te bevorderen?

Vastgoed waarderingstechnieken:

8. Wat zijn karakteristieke eigenschappen van ecologische woonwijken die de prijs van de woningen van een ecologische woonwijken beïnvloeden?
9. Welke variabelen van een ecologische woonwijken worden meegenomen bij de waardering van de woningen?
10. Heeft de locatie van de woningen in een ecologische woonwijk invloed op de waardering?
11. Zou er een specifiek businessmodel toegepast moeten worden bij de ontwikkeling van ecologische woonwijken?
12. Welke waarderingstechnieken worden momenteel toegepast op het taxeren van woningen in een ecologische woonwijken en welke zijn passend?

Ontwikkelingen:

13. Kan het effect van ontwikkelingen op huidige waarderingsmethoden worden gemeten?
14. Welke specifieke wensen van betrokken partijen kunnen worden meegenomen bij de ontwikkeling van ecologische woonwijken, anders dan de reguliere bouwsector?

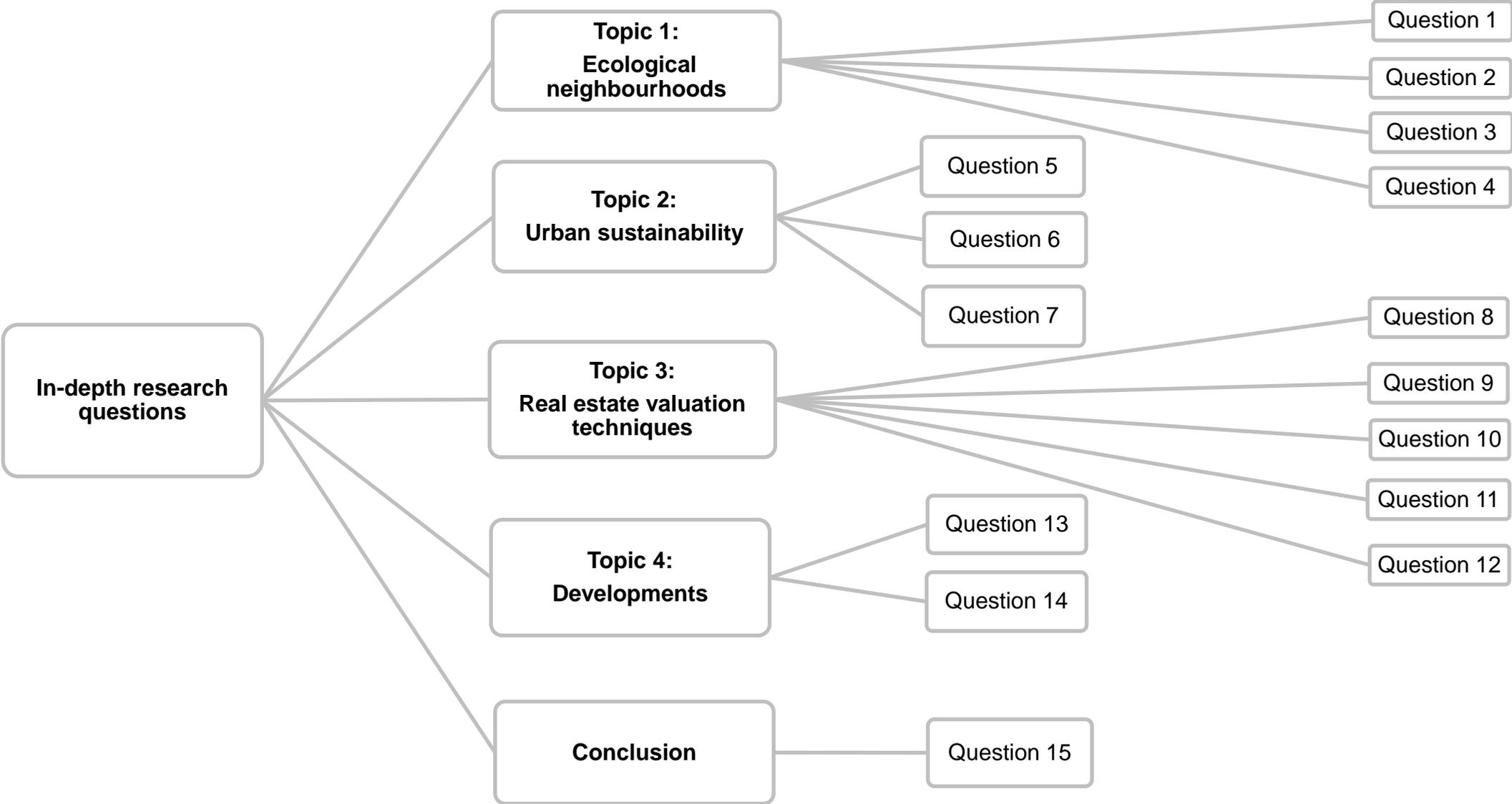
Conclusie

15. In hoeverre denkt u dat het ontwikkelen van Nederlandse ecologische woonwijken van invloed is op passende waarderingstechnieken?

Afsluitende praktische vragen

16. Zijn er relevante bedrijfsdocumenten die ik mag gebruiken voor mijn onderzoek?
17. Wilt u mijn rapport graag ontvangen?
18. Bent u bereid tot het beantwoorden van aanvullende vragen via de e-mail?
19. Mag ik mijn conclusie naar u opsturen voor feedback en aanvullingen?
20. Mag uw bedrijfsnaam vermeld worden in mijn onderzoek?
21. Mag ik de resultaten uit dit interview voorleggen aan derden?

Figure 15. Overview of interview questions (By author, 2019).



Appendix 3. Overview research methods

Table 16. Overview research methods for sub-questions by author (2019).

Method of data collection	Interviews	Deskresearch
Measurement instrument	Semi-structured interviews	<p>General data sources for simulations: Rijksoverheid (2019), JLL (2019), Ruimtelijkeplannen.nl (2019), Savills (2019), CBRE (2019), Dynamis (2019), Cushman and Wakefield (2019).</p> <p>Specific data sources for simulations: RICS (2019), Funda.nl (2019), Van Timmeren (2008), Van Timmeren et al., (2007), Portilla (2019), Van Hal (2016), Rijksdienst Voor Ondernemend Nederland (2019a), transaction documents of participants, real estate agents and valuers Mr. M. Koopmans, Mr. T. van Hillo and Mr. M. Muller.</p>
Measurement subject	<p>Experts on valuation: Professors RICS (2019) Real estate agents Valuators Developers</p>	
Data analysis	Open coding, axial and selective coding	
Reasoning	This case study will be approached from different perspectives: Real estate agents, valuers, developers and experts. In this way knowledge from people, with different functions is taken into account to create a vision that suits the valuation topic.	Suitable documents will be researched, with the aim of adding to the information gathered by interviews and observations.
Applicable	All the sub-questions	All the sub-questions

 Appendix 4. Examples open coding interviews

<p>Onderzoeksvragen:</p> <ol style="list-style-type: none"> 1. Wat is de toegevoegde waarde van een ecologische woonwijk? 2. Betreft een ecologische woonwijk vooral duurzaamheid? 3. Wat is de toegevoegde waarde van een eigen woning in een ecologische woonwijk t.o.v. huur? 4. Wat is de bereidwilligheid van investeerders om te investeren in duurzaamheid? 5. Zijn er 5 interviews mogelijk met 5 belanghebbenden van ecologische woonwijk De Kiem? 	
<p>1. Wat is de toegevoegde waarde van een ecologische woonwijk?</p> <p>De heer Westdorp vertelt in het gesprek over het ontstaan van de ecologische woonwijk De Kiem (2018). De ecologische woonwijk is ontstaan door een initiatief van de nieuwe aanpak (DNA, 2018). DNA (2018) is daarmee de oprichter van de ecologische woonwijk. Er is nagedacht over de definitie van een ecologische woonwijk. Betreft het bestaande bouw of vooral nieuwbouwwoningen? In ecologische woonwijk De Kiem (2018) is ervoor gekozen reguliere woningen te bouwen met een duurzaam karakter. Er is niet gekozen om bijvoorbeeld leemwoningen te bouwen. Vanuit ontwikkelaars is een plan ontstaan over een ecologische woonwijk. Het plan is ontstaan met 10 ideeën. Het definitieve plan is ingediend bij gemeente Arnhem en heeft akkoord gekregen. De gemeente Arnhem heeft niet geïnvesteerd of gesubsidieerd in de ecologische woonwijk. De gemeente Arnhem heeft akkoord gegeven voor het bouwen van de ecologische woonwijk, heeft grond beschikbaar gesteld, heeft een eco-label verstrekt en maakt reclame via internet voor de ecologische woonwijk. In ecologische woonwijk De Kiem (2018) woont een groot deel uit de directe omgeving van Arnhem, maar ook een groot deel van de bewoners komt bijvoorbeeld uit het Westen. Het specifieke concept van de</p>	<p>Reguliere woningen te bouwen met een duurzaam karakter.</p> <p>De gemeente Arnhem heeft niet geïnvesteerd of gesubsidieerd in de ecologische woonwijk.</p> <p>Het specifieke concept van de ecologische</p>

Appendix 5. Observation sheets

1. E.V.A. Lanxmeer Culemborg

Observation 7th of March 2019 10.00 A.M. at Culemborg

Typical characteristics:

Timber frame construction, shared spaces, hot water housekeeping by solar panels, green environment, limiting hardening, organic landscape development, integral waterconcept, conditions for a social environment, no car spaces, ecological building materials, ecological town farm, centrally located location, sustainable building, ecological architecture, biogas installation, sample function and education, adapted infrastructure, few main roads, natural banks, combined with care function, helofytenfilters and no drain by municipality sewer.



Figure 17. Observation E.V.A. Lanxmeer Culemborg (By author, 2019).

2. Woonderij EOS Zutphen

Observation 8th of February 2019 11.00 A.M. at Zutphen

Typical characteristics:

Timber frame construction, shared spaces, solar panels, green environment, limiting hardening, organic landscape development, conditions for a social environment, no car spaces, ecological building materials, sustainable buildings, ecological architecture, adapted Infrastructure, few main roads and combined with care function.



Figure 18. Observation Woonderij EOS Zutphen (By author, 2019).

3. De Kiem Arnhem

Observation 14th of March 2019 10.00 A.M. at Arnhem

Typical characteristics:

Timber frame construction, shared spaces, solar panels, green environment, EPC standardisation, limiting hardening, organic landscape development, conditions for a social environment, no car spaces, ecological building materials, centrally located location, sustainable building, ecological architecture, adapted Infrastructure and few main roads.



Figure 19. Observation De Kiem Arnhem (By author, 2019).

4. BWWB 's Hertogenbosch

Observation 15th of February 2019 10.00 A.M. at 's Hertogenbosch

Typical characteristics:

Timber frame construction, shared spaces, hot water housekeeping by solar panels, green environment, EPC standardisation, limiting hardening, organic landscape development, integral waterconcept, conditions for a social environment, no car spaces, ecological building materials, sustainable building, ecological architecture, adapted Infrastructure, few main roads and no drain by municipality sewer.



Figure 20. Observation BWWB 's Hertogenbosch (By author, 2019).

The relation

The **current situation** is **X**. The **desired situation** **Y** arises in new residential houses of ecological neighbourhoods regarding the latest sustainable developments of the construction sector (Slack and Rowley, 2001).

Table 21. Relation of characteristics of ecological neighbourhoods (By author, 2019).

Characteristics	E.V.A. Lanxmeer	Woonderij EOS	De Kiem	BWWB
Timber frame construction	Y	Y	Y	Y
Shared spaces				
Hot water housekeeping by solar panels				
Green environment				
EPC standardisation	X			
Limiting hardening	Y	Y		
Organic landscape development		X		
Integral waterconcept				
Conditions for a social environment				
Ecological building materials				
Centrally located location				
Sample function and education				
Helofytenfilters				
No drain by municipality sewer	X			
No car spaces				
Zero Energy Building (ZEB)				

X = Current situation

Y = Desired situation

Appendix 6. Comparison advantages and disadvantages of ecological neighbourhoods

Table 22. Comparison ecological neighbourhoods based on Van Hal (2016), Van Timmeren et al., (2007), Van Timmeren (2008), Intergovernmental Panel on Climate Change (2019), Dynamis (2019), Rooijers, Schepers, Van Gerwen and Van der Veen (2014), Rijksdienst Voor Ondernemend Nederland (2019a and b), Moorty and Jacob (2012) and Ecofys (2018).

	1. E.V.A. Lanxmeer	2. Woonderij EOS	3. De Kiem	4. BWWB
Social cohesion	Y Urban planning with futureproof houses and innovation of construction sector. Creation of social value and new regulations.			
Reducing of primary resource consumption				
Reusing or recycling materials				
Reducing construction and demolition of waste				
Water retention and re-use	Y	X	Y	
Water purification				
Energy saving and heat production		Y		
Integrated landscape design	Y	X		
Biological food production				
Participation of inhabitants	Y Related to social control Different behaviour is required		X	Y
Awareness, information, and education	X Older houses without new standards and development		Y Profits and revenue from own energy. New developments are standard nowadays	
Zero Energy Building (ZEB)	X Older houses without new standards and development		Y Profits and revenue from own energy. New developments are standard nowadays	
Bijna Energie Neutral (BENG) houses	X Older houses without new standards and development		Y Profits and revenue from own energy. New developments are standard nowadays	
Energie Prestatie Coëfficiënt (EPC) standardisation	X Older houses without new standards and development		Y Profits and revenue from own energy. New developments are standard nowadays	

Limitations for construction sector	X	Y	
Higher construction costs	X		
New developments are not applied	X	Y	
Selected group of residents	X Attraction of residents with high living standards	Y	
Social control	X Adaptation of behaviour	Residents develop their own houses without development costs. New developments and new knowledge are standard nowadays	
Legislation of property	X High cost, because of > 20-year-old ecological neighbourhoods		
Pollution prevention costs			
Environmental protection costs			
Costs of resource recycling			
Environmental restoration costs			
Management costs			
Social promotion activities costs			
Research and development costs			
Longer period of the transaction			X Not everybody is willing to live in an ecological neighbourhood

X = Current situation

Y = Desired situation

Appendix 7. Comparison advantages and disadvantages of traditional valuation techniques

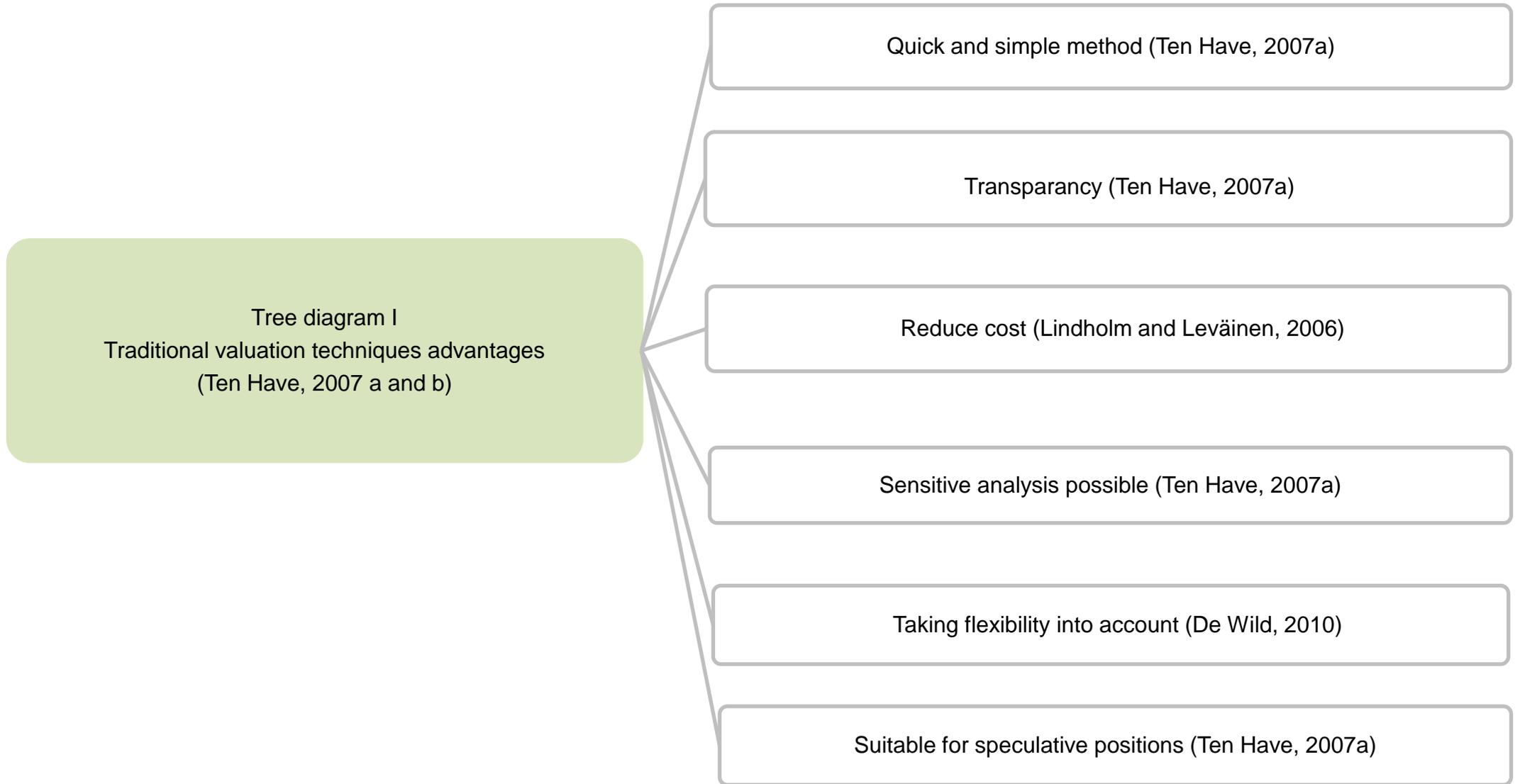
Table 23. Comparison traditional valuation techniques based on Berkhout and Hordijk (2008), Ten Have (2007a and b), De Wild (2010), Lusht (2001), Geltner et al., (2014), Dynamis (2019), Portilla (2019), Witvoet et al., (2007), Roodhof (2012), Rompelberg and Hesp (2007).

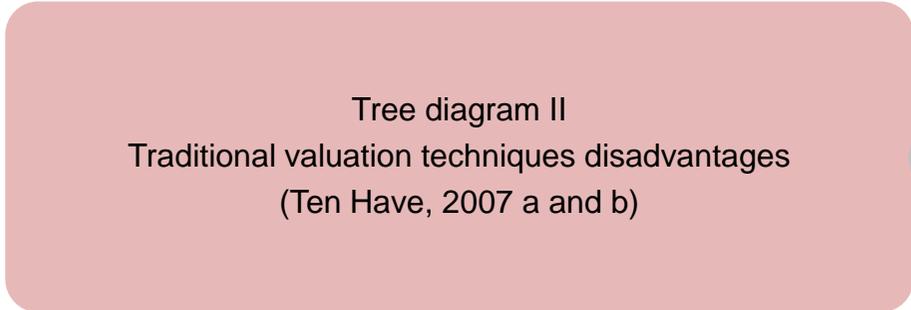
	1. Comparative methods	2. Cost approach methods	3. Income approach methods
Simple		Y	
Comparison possible	X Comparable market-based transactions are not always available	Y Land price based on sales, not necessarily market based	X Complicated calculations based on longer period
Transparent		Y	
Objective or subjective	Y	X Market parties take different starting points as a basis for calculating costs, profit and risk	
Suitable for valuation of speculative positions		Y	
Sensitivity analysis		X	Y No value, as plans that do not show the maximum and best use are also discussed
Scenario analysis			
Flexibility considered	X	Y	Y
Good for long turn-around time	X Undervaluation of projects with long service life, high risks, and flexibility		

X = Current situation

Y = Desired situation

Appendix 8. Operationalisation – Tree diagrams





Not suitable for redevelopment (Ten Have, 2007a)

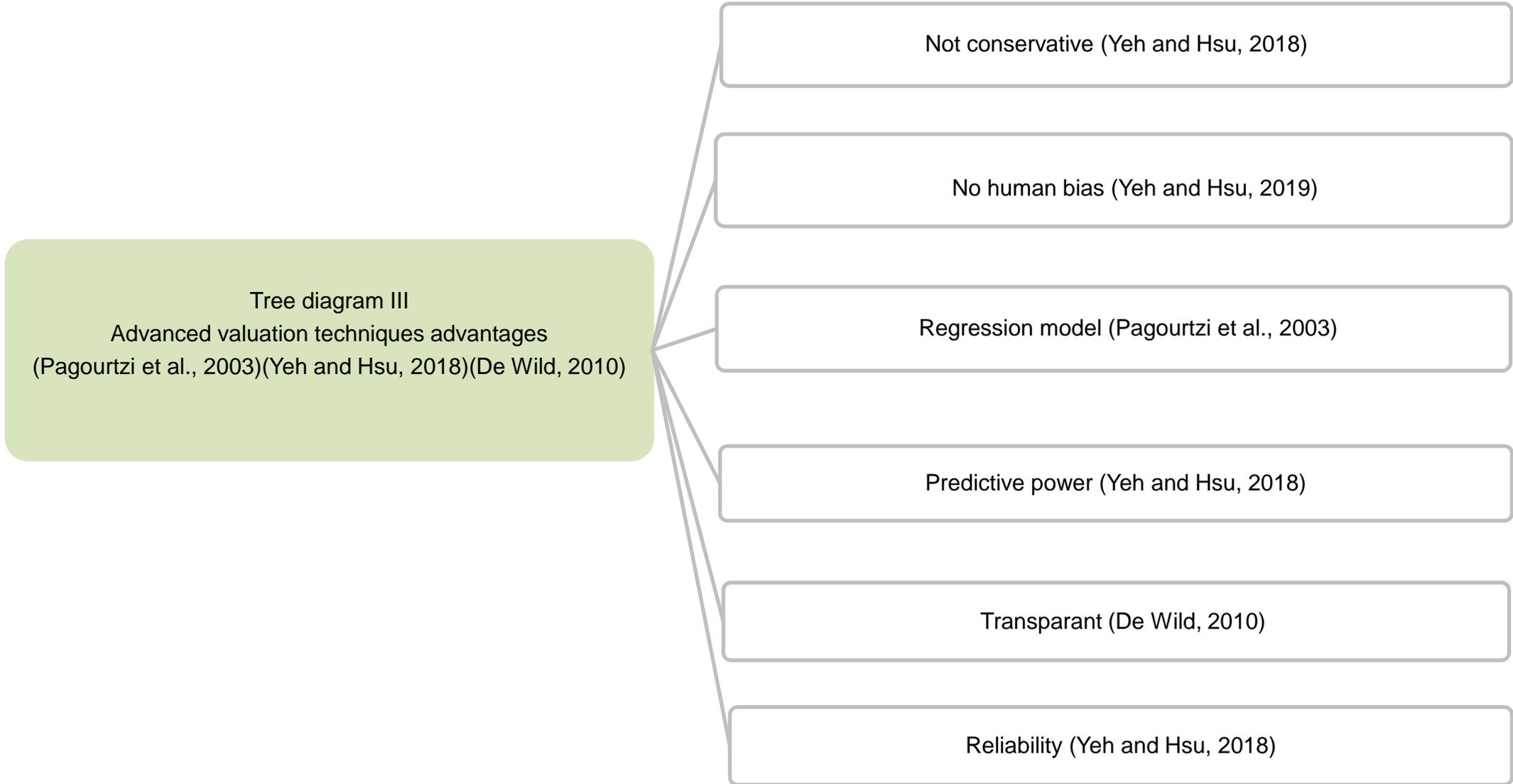
No market valuation (De Wild, 2010)

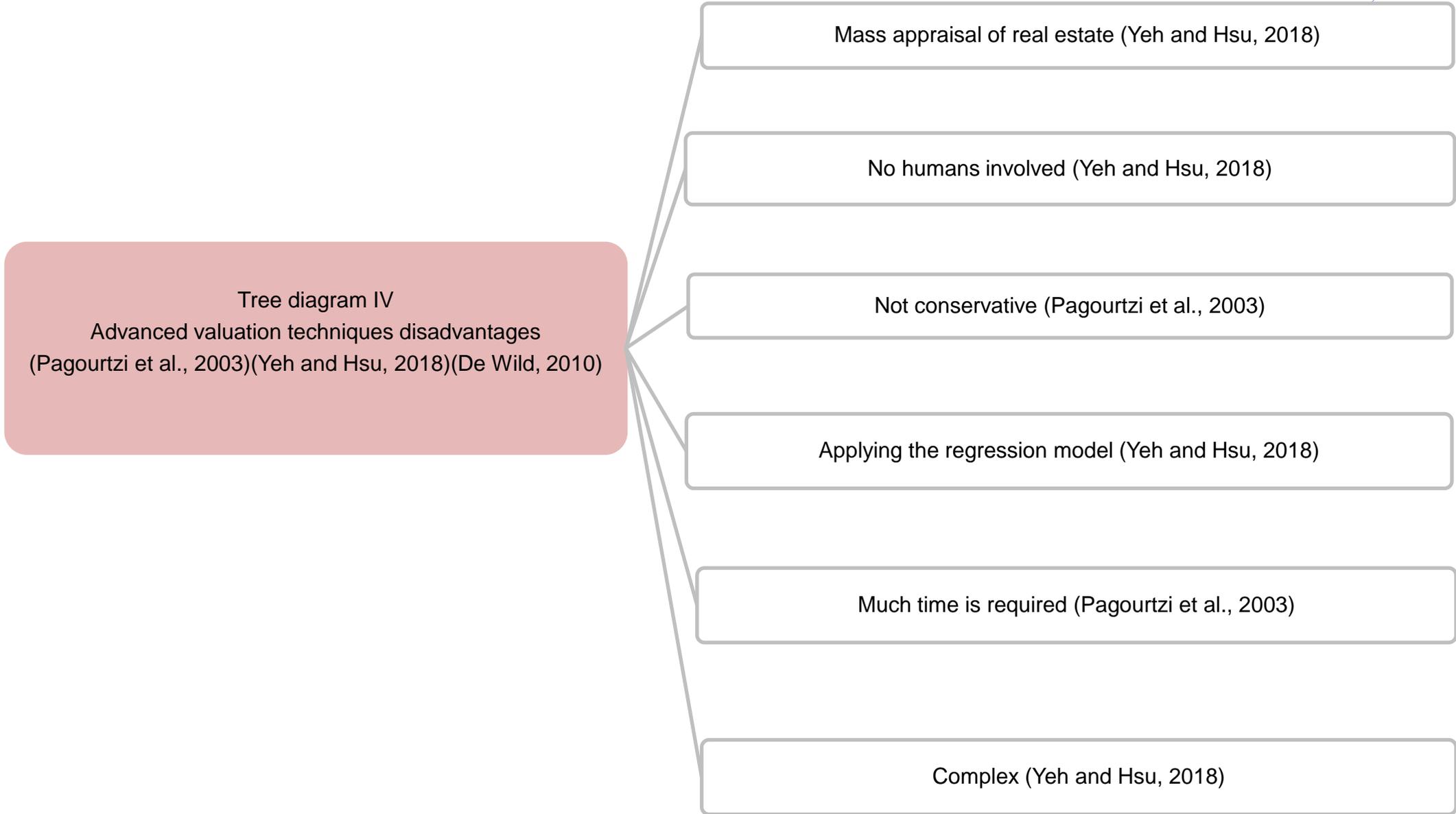
Very extensive information needed (Ten Have, 2007a and b)

Subjective estimations needed of costs (De Wild, 2010)

Flexibility is required (Ten Have, 2007a and b)

Sensitivity analysis not possible (Ten Have, 2007a)





Tree diagram IV
Advanced valuation techniques disadvantages
(Pagourtzi et al., 2003)(Yeh and Hsu, 2018)(De Wild, 2010)

Mass appraisal of real estate (Yeh and Hsu, 2018)

No humans involved (Yeh and Hsu, 2018)

Not conservative (Pagourtzi et al., 2003)

Applying the regression model (Yeh and Hsu, 2018)

Much time is required (Pagourtzi et al., 2003)

Complex (Yeh and Hsu, 2018)

Appendix 9. Excelfile I and USB: (ValQ) calculations of traditional and advanced valuation techniques

Automatisch opslaan | PLANNING Master Thesis tree diagram, open, axial coding, meeting, calculation and 15 interviews by Schuijt - Excel | Yvonne Schuijt

Bestand Start Invoegen Pagina-indeling Formules Gegevens Controleren Beeld Help Vertel wat u wilt doen

Knippen, Kopiëren, Opmaak kopiëren/plakken, Klembord, Lettertype, Uitlijning, Getal, Stijlen, Cellen, Bewerken

E45 =E43-(E9+E15+E25+E32)

ValQ	Scenario extended		Housing
	Land exploitation		
Costs	m ²	m ²	
Purchase area		21256	€ 40,00
Transfer tax		2%	€ 17.004,80
Remediation costs			€ 0,00
Demolition stalling			€ 250.000,00
Notary fees purchase		0,003%	€ 2.550,72
Purchase costs			€ 1.119.795,52
Construction costs	m ²	€/m ²	€
Option interest to the owner			€ 0,00
Urban facilities	21256		€ 0,00
Infrastructure	21256	20	€ 425.120,00
Commission third	0	0	€ 0,00
Total			€ 425.120,00
Additional costs	m ²	€/m ²	€
Change of destination			€ 50.000,00
Notary fees sales		%	
Soil research			€ 5.000,00
Plan damage			€ 0,00
Archaeological research			€ 0,00
Environmental research			€ 1.500,00
Sound research			€ 0,00
Adventitious			€ 25.000,00
Total			€ 81.500,00

Transcript 7 | Transcript 8 | Transcript 9 | Transcript 10 | Transcript 11 | Transcript 12 | Transcript 13 | Transcript 14 | Transcript 15 part I | Transcript 15 part II | Calculation land exploitation | ATASTI & SPS ...

Gereed | 22:13 | 24-5-2019

Appendix 10. Excelfile II and USB: Main tree diagram, coding and transcripts

The screenshot shows an Excel spreadsheet with the following structure:

A	B	C	D	E	F	G	H	I	J	K	L	M
	Topics	Subtopics	Sources									
1												
2	FREM and Real estate											
3		Y = desired situation										
4		X = current situation										
5	Valuation techniques advantages											
6		Simple method	Ten Have, G.G.M. (2007a). <i>Taxatieleer Vastgoed 1</i> . Groningen: WoltersNoordhoff									
7		Comparison well possible	Ten Have, G.G.M. (2007b). <i>Taxatieleer Vastgoed 2</i> . Groningen: WoltersNoordhoff.									
8		Blockchain	RICS (2019). <i>Royal Institution of Chartered Surveyors. Taxatieconferentie circulariteit</i>									
9		Quick method	Ten Have, G.G.M. (2007a). <i>Taxatieleer Vastgoed 1</i> . Groningen: WoltersNoordhoff									
10		Increase innovation	Lindholm, & Leväinen. (2006). A framework for identifying and measuring value added by									
11		Transparency	Portilla, J. (2019). <i>Associate Professor. Master in Real Estate Development</i> . [PowerPc									
12		Suitable for valuation of speculative positions	Ten Have, G.G.M. (2007a). <i>Taxatieleer Vastgoed 1</i> . Groningen: WoltersNoordhoff									
13	Y	Increase flexibility	Lindholm, & Leväinen. (2006). A framework for identifying and measuring value added by									
14		Increase value of assets	Lindholm, & Leväinen. (2006). A framework for identifying and measuring value added by									
15		Interdependence	Pagourtzi, E., Assimakopoulos, V., Hatzichristos, T., & French, N. (2003). Real estate ap									
16		Complexity	Pagourtzi, E., Assimakopoulos, V., Hatzichristos, T., & French, N. (2003). Real estate ap									
17		Promote marketing and sale	Lindholm, & Leväinen. (2006). A framework for identifying and measuring value added by									
18		Successful business	Pagourtzi, E., Assimakopoulos, V., Hatzichristos, T., & French, N. (2003). Real estate ap									
19		Sustainable benefits	Van Timmeren, A. (2008). The urban metabolism as a basis for integration strategies an									
20		Technology	Lindholm, & Leväinen. (2006). A framework for identifying and measuring value added by									
21		Lowest price	Van Timmeren, A. (2008). The urban metabolism as a basis for integration strategies an									
22		Develop methods	Van Hal, A. (2009). <i>De fusie van belangen. Over duurzaamheid en rendement in de bu</i>									
23		Reduce cost	Lindholm, & Leväinen. (2006). A framework for identifying and measuring value added by									
24		Possibility to finance	Pagourtzi, E., Assimakopoulos, V., Hatzichristos, T., & French, N. (2003). Real estate ap									
25		Controlling risk	Pagourtzi, E., Assimakopoulos, V., Hatzichristos, T., & French, N. (2003). Real estate ap									
26		Flexibility	Ten Have, G.G.M. (2007b). <i>Taxatieleer Vastgoed 2</i> . Groningen: WoltersNoordhoff.									

The spreadsheet also shows a taskbar at the bottom with various application icons and a system tray with the time 13:43 and date 10-6-2019.

Transcript Interview Prof. Dr. Ir. Mrs. A. van Hal

Automatisch opslaan

Tree diagram, open and axial coding qualitative test by Schuijt (version 1)(Automatisch hersteld) - Opgeslagen

Yvonne Schuijt

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Kopiëren
Opmaak kopiëren/plakken
Klembord

Arial 12

Tekstterugloop

Standaard

Voorwaardelijke opmaak

Opmaken als tabel

Celstijlen

Invoegen Verwijderen Opmaak

AutoSom

Doorvoeren

Wissen

Sorteren en filteren

Zoeken en selecteren

Bewerken

A11

1 **Interview Prof. Dr. Ir. Mrs A. van Hal**

2

3 Person and function: Prof. Dr. Ir. Mrs. A. van Hal, professor sustainable building & development

4 Company: Nyenrode Business Universiteit at Breukelen

5 Expertise: Ecological neighbourhoods, developments, benchmarking, green accounting and urban planning.

6 Date: Monday, 28th of January 2019 09.00 A.M.

7 Place: DEVENTER by phone

8 Duration: 30 minutes

9 Interviewer: Yvonne Schuijt

10 Confidential: Yes

11

12 **Onderzoeker:**

13 Allereerst heel erg bedankt dat u mij te woord wilt staan. U bent mevrouw Van Hal, Prof. Dr. Ir. van Nyenrode Business Universiteit te Breukelen en ik ben Yvonne Schuijt, student aan Saxion MFREM. U gaf aan dat u niet zo veel kon toevoegen aan mijn gekozen onderwerp. Maar, uw kennis van duurzaamheid is heel belangrijk en dat kan ik goed toepassen in mijn onderzoek. Ik zou eigenlijk uw rol als onafhankelijk willen zien binnen mijn onderzoek. En op die wijze uw informatie verwerken in mijn master thesis. Ik richt mij op passende waarderingstechnieken met betrekking tot vastgoed van particuliere woningen in een Nederlandse ecologische woonwijk, bekeken vanuit het oogpunt van betrokken belanghebbenden. Van u verneem ik graag uw onafhankelijke expertise op het gebied van ecologische woonwijken en duurzaamheid.

14 **Participant:**

15 Met Anke van Hal. Je staat niet op de luidspreker, dan moet ik even een parkeerplaats zoeken. Ik hang je even op. Kan je nog een keer proberen te bellen? Je klinkt heel zacht. Ik denk dat het door WhatsApp komt. Moeten we maar even kijken of het lukt. Ja, ik ben Anke Van Hal, hoogleraar aan Nyenrode Business Universeit in Breukelen. Ik ga akkoord met de beantwoording van de verdiepingsvragen.

16 **Onderzoeker:**

17 Wellicht kunt u iets vertellen over wat uw visie is over duurzaamheid en of u daarin een relatie ziet met een ecologische woonwijk?

18 **Participant:**

19 Hmmmm, jazekeer even kijken. Heb je het onderzoek over de ecologische woonwijken gezien dat wij de gedaan hebben?

20 **Onderzoeker:**

Transcript 1 | Transcript 2 | Transcript 3 | Transcript 4 | Transcript 5 | Transcript 6 | Transcript 7 | Transcript 8 | Transcript 9 | Transcript 10 | Transcript 11 | Transcript 12 | Transcript 13 | Transcript 14

Gereed

11:24
5-4-2019

Transcripts meetings Associate Prof. Mr. J. Portilla

Automatisch opslaan PLANNING Master Thesis tree diagram, open, axial coding, meeting, calculation and 15 interviews by Schuijt - Opgeslagen Yvonne Schuijt

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Knippen Kopieëren Plakken Opmaak kopieëren/plakken Klembord Lettertype Uitlijning Teksletterloop Samenvoegen en centreren Getal Voorwaardelijke opmaak Opmaken als tabel Celstijlen Invoegen Verwijderen Opmaak AutoSom Doorvoeren Wissen Sorteren en filteren Zoeken en selecteren Bewerken

F2

1 **MEETING Prof. J. Portilla IE Business School Master Real Estate Developments Madrid Spain**

2

3 Person and function: Juan Portilla, Associate Professor

4 Company: IE Business School Master Real Estate Developments (MRED) Madrid Spain

5 Expertise: Real estate, effect of developments and urban sustainability.

6 Date: Tuesday, 30th of April 2019 at 18.00 P.M.

7 Place: DEVENTER by virtual meeting

8 Duration: 90 minutes

9 Interviewer: Yvonne Schuijt

10 Confidential: Yes

11

12 **Urban sustainability:**

13 What is sustainability in the construction sector, according to you?

14 **Real estate:**

15 Which valuation techniques are applied nowadays and how to value sustainable applications in buildings?

16 **Developments:**

17 What about sustainable and ecological applications in real estate in the world? London is a leader on sustainability, and ecology, right? What is your definition of ecological applications in real estate?

18

19 Flavio: Hi Yvonne, from valuation techniques aprat of the traditional techniques, we are currently exploring Digital Tools to get more data driven decision

20

21 Yvonne 2: Thnx Flavio!

22

23 Flavio: Also, we are in the process to certificate our program under RICS

24

25 Yvonne 2: What about sustainable and ecological applications in real estate in the world? London is a leader on sustainability, and ecology, right? What is your definition of ecological applications in real estate?

26 ----- (04/30/2019 19:13) -----

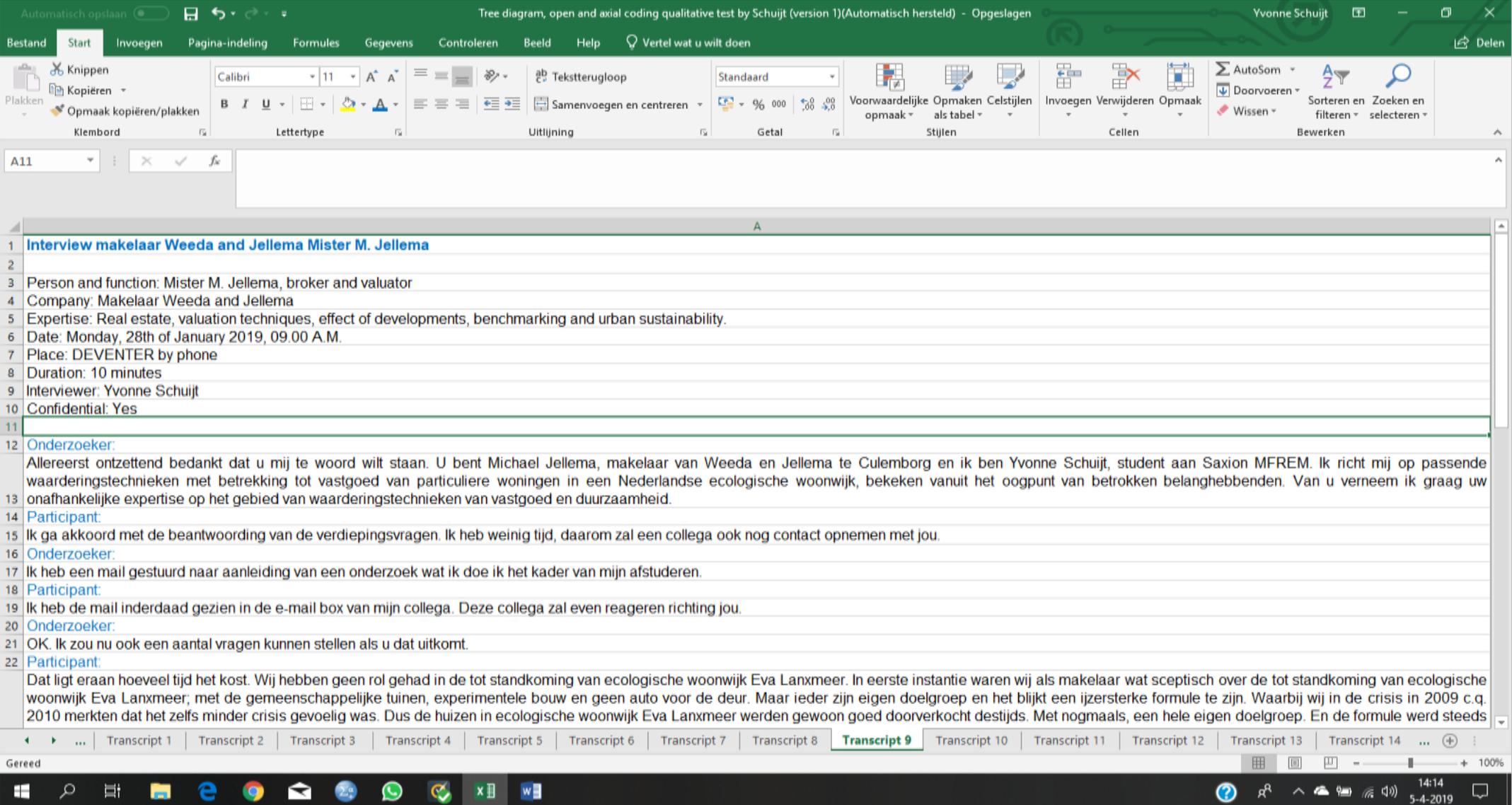
27

Gereed

Coding disadvantages ECO Axial and selected coding VT Axial and selected coding ECO **MEETING Prof. Portilla** Transcript 1 Transcript 2 Transcript 3 Transcript 4 Transcript 5 Transcript 6 Tran ...

13:33 5-5-2019

Transcript 1. Interview Mister M. Jellema



Automatisch opslaan Tree diagram, open and axial coding qualitative test by Schuijt (version 1)(Automatisch hersteld) - Opgeslagen Yvonne Schuijt

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Opmaak kopiëren/plakken

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B I U Lettertype

Tekstterugloop
Standaard

Samenvoegen en centreren

Uitlijning

Getal

Voorwaardelijke opmaak
Opmaak als tabel
Celstijlen

Invoegen Verwijderen Opmaak

Cellen

AutoSom
Doorvoeren
Wissen

Sorteren en filteren
Zoeken en selecteren

Bewerken

All

1 **Interview makelaar Weeda and Jellema Mister M. Jellema**

2

3 Person and function: Mister M. Jellema, broker and valuator

4 Company: Makelaar Weeda and Jellema

5 Expertise: Real estate, valuation techniques, effect of developments, benchmarking and urban sustainability.

6 Date: Monday, 28th of January 2019, 09.00 A.M.

7 Place: DEVENTER by phone

8 Duration: 10 minutes

9 Interviewer: Yvonne Schuijt

10 Confidential: Yes

11

12 **Onderzoeker:**

13 Allereerst ontzettend bedankt dat u mij te woord wilt staan. U bent Michael Jellema, makelaar van Weeda en Jellema te Culemborg en ik ben Yvonne Schuijt, student aan Saxion MFREM. Ik richt mij op passende waarderingstechnieken met betrekking tot vastgoed van particuliere woningen in een Nederlandse ecologische woonwijk, bekeken vanuit het oogpunt van betrokken belanghebbenden. Van u verneem ik graag uw onafhankelijke expertise op het gebied van waarderingstechnieken van vastgoed en duurzaamheid.

14 **Participant:**

15 Ik ga akkoord met de beantwoording van de verdiepingvragen. Ik heb weinig tijd, daarom zal een collega ook nog contact opnemen met jou.

16 **Onderzoeker:**

17 Ik heb een mail gestuurd naar aanleiding van een onderzoek wat ik doe ik het kader van mijn afstuderen.

18 **Participant:**

19 Ik heb de mail inderdaad gezien in de e-mail box van mijn collega. Deze collega zal even reageren richting jou.

20 **Onderzoeker:**

21 OK. Ik zou nu ook een aantal vragen kunnen stellen als u dat uitkomt.

22 **Participant:**

23 Dat ligt eraan hoeveel tijd het kost. Wij hebben geen rol gehad in de tot standkoming van ecologische woonwijk Eva Lanxmeer. In eerste instantie waren wij als makelaar wat sceptisch over de tot standkoming van ecologische woonwijk Eva Lanxmeer, met de gemeenschappelijke tuinen, experimentele bouw en geen auto voor de deur. Maar ieder zijn eigen doelgroep en het blijkt een ijzersterke formule te zijn. Waarbij wij in de crisis in 2009 c.q. 2010 merkten dat het zelfs minder crisis gevoelig was. Dus de huizen in ecologische woonwijk Eva Lanxmeer werden gewoon goed doorverkocht destijds. Met nogmaals, een hele eigen doelgroep. En de formule werd steeds

Transcript 1 | Transcript 2 | Transcript 3 | Transcript 4 | Transcript 5 | Transcript 6 | Transcript 7 | Transcript 8 | **Transcript 9** | Transcript 10 | Transcript 11 | Transcript 12 | Transcript 13 | Transcript 14

Gereed

14:14
5-4-2019

Transcript 2. Interview Mister T. Van Hillo

Automatisch opslaan Tree diagram, open and axial coding qualitative test by Schuijt (version 1)(Automatisch hersteld) - Opgeslagen Yvonne Schuijt

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Knippen Plakken Kopieëren Opmaak kopiëren/plakken Klembord Lettertype Uitsluiting Teksletterloop Samenvoegen en centreren Getal Stijlen Cellen Bewerken

A11

1 **Interview Makelaar Weeda and Jellema Mister T. Van Hillo**

2

3 Person and function: Mister T. van Hillo

4 Company: Makelaar Weeda and Jellema

5 Expertise: Real estate, valuation techniques, effect of developments, benchmarking and urban sustainability.

6 Date: Monday, 28th of January 2019, 14.00 A.M.

7 Place: DEVENTER by phone

8 Duration: 20 minutes

9 Interviewer: Yvonne Schuijt

10 Confidential: Yes

11

12 **Onderzoeker:**
Allereerst ontzettend bedankt dat u mij te woord wilt staan. U bent Thom van Hillo, makelaar van Weeda en Jellema te Culemborg en ik ben Yvonne Schuijt, student aan Saxion MFREM. Ik richt mij op passende waarderingstechnieken met betrekking tot vastgoed van particuliere woningen in een Nederlandse ecologische woonwijk, bekeken vanuit het oogpunt van betrokken belanghebbenden. Van u verneem ik graag uw onafhankelijke expertise op het gebied van waarderingstechnieken van vastgoed en duurzaamheid.

13

14 **Participant:**
Ik ben Thom van Hillo, makelaar van Weeda en Jellema te Culemborg. Ik ga akkoord met de beantwoording van de verdiepingvragen.

15

16 **Onderzoeker:**
Van u heb ik een mail ontvangen, dat ik mocht bellen voor aanvullende vragen voor mijn onderzoek.

17

18 **Participant:**
Ja dat klopt, want u had mijn collega Michael Jellema gesproken, geloof ik. Ik wil u te woord staan, voorzover ik de vragen kan beantwoorden, is dat verder geen probleem.

19

20 **Onderzoeker:**
Ja, ik heb heel kort gesproken met uw collega vanochtend. U bent bekend met ecologische woonwijk Eva Lanxmeer. Klopt dat?

21

22 **Participant:**
Ja, zowel in de bestaande bouw als in nieuwbouwontwikkeling wat wij hebben mogen begeleiden als makelaar. Het is ook zo dat andere makelaars in ecologische woonwijk De Kiem huizen mogen verkopen. Maar, wij mogen daar een groot deel van de woningen verkopen. Dat klopt.

23

24 **Onderzoeker:**

Transcript 1 | Transcript 2 | Transcript 3 | Transcript 4 | Transcript 5 | Transcript 6 | Transcript 7 | Transcript 8 | Transcript 9 | **Transcript 10** | Transcript 11 | Transcript 12 | Transcript 13 | Transcript 14 ... 100%

Gereed 14:22 5-4-2019

Transcript 3. Interview Mister M. Koopmans.

Automatisch opslaan

Tree diagram, open and axial coding qualitative test by Schuijt (version 1)(Automatisch hersteld) - Hersteld - Opgeslagen

Yvonne Schuijt

Bestand Start Invoegen Pagina-indeling Formules Gegevens Controleren Beeld Help Vertel wat u wilt doen

Knippen
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Opmaak kopiëren/plakken

Calibri 11

Lettertype

Tekstterugloop

Standaard

Uitlijning

Samenvoegen en centreren

Getal

Voorwaardelijke opmaak

Opmaak als tabel

Celstijlen

Invoegen Verwijderen Opmaak

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AutoSom

Doorvoeren

Wissen

Sorteren en filteren

Zoeken en selecteren

Bewerken

A11

1 **Interview Eggink Maalderink Makelaars Mister M. Koopmans**

2

3 Person and function: Mister M. Koopmans, broker and valuator

4 Company: Eggink Maalderink Makelaars

5 Expertise: Real estate, valuation techniques, effect of developments, benchmarking and urban sustainability.

6 Date: Thursday, 14th of February 2019, 10.00 A.M.

7 Place: DEVENTER by phone

8 Duration: 60 minutes

9 Interviewer: Yvonne Schuijt

10 Confidential: Yes

11

12 **Onderzoeker:**
Allereerst ontzettend bedankt dat u mij te woord wilt staan. U bent Martin Koopmans, taxateur en makelaar te Zutphen en ik ben Yvonne Schuijt, student aan Saxion MFREM. Ik richt mij op passende waarderingstechnieken met betrekking tot vastgoed van particuliere woningen in Nederlandse ecologische woonwijken, bekeken vanuit het oogpunt van betrokken belanghebbenden. Van u verneem ik graag uw onafhankelijke expertise op het gebied van ecologische woonwijken en toepassing van duurzaamheid.

13

14 **Participant:**
Ik ben Martin Koopmans taxateur en makelaar van makelaar Eggink Maalderink te Zutphen. Ik ga akkoord met de beantwoording van de verdiepingvragen. Gaandeweg het interview zal ik de vragen beantwoorden. Ik bel via een verbinding via internet, waardoor ik soms weg val.

15

16 **Onderzoeker:**
Ziet u een verschil in het taxeren van woningen van traditionele bouw ten op zichte van woningen in een ecologische woonwijk?

17

18 **Participant:**
Dat is op zich een hele goede vraag. Ik ben heel lang geleden betrokken geweest bij de verkoop van woningen van ecologische woonwijk EOS te Zutphen en recentelijk bij de verkoop van een woning aan de Joke Smitlaan 190 te Zutphen. De woningen in een ecologische woonwijk hebben bepaalde kenmerken. Maar, de taxatie bij ons vindt plaats op basis van woonoppervlakte, bouwjaar en onderhoud. Wij kijken bij het taxeren naar bepaalde kenmerken van woningen. Die kenmerken zijn bij woningen in een ecologische woonwijk anders dan bij traditionele woningen. Er zijn maar een beperkt aantal eco-woningen in Zutphen. Wij vragen verkoopcijfers op van vergelijkbare woningen. Hoe ouder de verkoopcijfers van woningen zijn, hoe minder bruikbaar de cijfers worden.

19

20 **Onderzoeker:**
Wat is uw definitie van een ecologische woonwijk?

21

Transcript 1 | Transcript 2 | Transcript 3 | Transcript 4 | Transcript 5 | Transcript 6 | Transcript 7 | Transcript 8 | Transcript 9 | Transcript 10 | Transcript 11 | **Transcript 12** | Transcript 13 | Transcript 14 ...

Gereed

14:54
5-4-2019

Transcript 4. Interview Mister R. Boesveld

Automatisch opslaan

Tree diagram, open and axial coding qualitative test by Schuijt (version 1)(Automatisch hersteld) - Opgeslagen

Yvonne Schuijt

Bestand Start Invoegen Pagina-indeling Formules Gegevens Controleren Beeld Help Vertel wat u wilt doen

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Opmaak kopiëren/plakken

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Lettertype

Tekstterugloop

Standaard

Uitlijning

Samenvoegen en centreren

Getal

Voorwaardelijke opmaak

Opmaak als tabel

Celstijlen

Invoegen

Verwijderen

Opmaak

AutoSom

Doorvoeren

Wissen

Sorteren en filteren

Zoeken en selecteren

Bewerken

A11

A

1 **Interview broker and valuator mister R. Boesveld**

2

3 Person and function: Mister R. Boesveld, broker and valuator

4 Company: Willemsen Makelaars

5 Expertise: Valuaton techniques, ecological neighbourhoods, developments, benchmarking, green accounting and urban planning.

6 Date: 3th of January 2019 at 11.00 A.M.

7 Place: Jansplaats 29, 6811 GB ARNHEM

8 Duration: 60 minutes

9 Interviewer: Yvonne Schuijt

10 Confidential: Yes

11

12 **Onderzoeker:**

13 U bent meneer Boesveld van Willemsen Makelaars en ik ben Yvonne Schuijt, student aan Saxion MFREM. Graag neem ik met u de verdiepingsvragen door voor mijn onderzoek in het kader van mijn afstuderen. De verdiepingsvragen zijn afgeleid van de hoofd onderzoek vraag. Waarbij ik begin met de verdiepingsvraag 1.

14 **Participant:**

15 Ik zal starten met het uitleggen van mijn rol in het totale project van ecologische woonwijk De Kiem (2018). Ik ben makelaar in het project, waarbij ik mij vooral richt op de verkoop van de woningen. In de start van het project heb ik meegekeken hoe de opgeleverde woningen zo goed mogelijk verkocht kunnen worden. Dat is meer dan alleen de stenen van de woningen in ecologische woonwijk De Kiem (2018). Er is een uitraag geweest tussen 2 makelaarskantoren. Uiteindelijk is gekozen voor Willemsen Makelaars, omdat Willemsen Makelaars gespecialiseerd is in duurzaamheid. Vanwege de expertise in duurzaamheid is het voor Willemsen Makelaars ook leuk om betrokken te zijn bij de verkoop van de woningen in ecologische woonwijk De Kiem (2018). Er zijn 4 projecten als onderdeel van ecologische woonwijk De Kiem (2018); Flexus, Bo Gro, De Ideale woning en van E-wonen.

16 **Onderzoeker stelt de verdiepingsvragen over Nederlandse ecologische woonwijken.**

17 **Participant:**

Wat ik sterk heb gemerkt bij de verkoop van de woningen van ecologische woonwijk De Kiem (2018), is dat veel bewoners kozen voor De Ideale Woning niet alleen vanwege de houtskelet bouw in het project, maar juist omdat De Ideale Woning iets collectiefs heeft, zoals een mandelige ruimte. Er is 1 team wat zich onderscheidt van de andere teams binnen ecologische woonwijk De Kiem (2018) en dat is de Ideale Woning. Bewoners van De Ideale Woning kozen bewust voor De Ideale Woning, omdat de woningen houtskeletbouw betroffen. De verwarming in deze woningen was op een andere manier georganiseerd ten opzichte van woningen van andere projecten. En bij de Ideale Woning is het collectiviteitsprincipe in het middengebied van het project belangrijk. Midden in het gebied van de ecologische woonwijk De Kiem (2018) is een mandelig terrein aanwezig, oftewel een ovale ontwikkeling. Aan de buitenrand zitten de woningen en aan de binnenrand zit het mandelig terrein. Het mandelige terrein is een terrein waarbij alle bewoners iets vakoopwoning. In ecologische woonwijk De Kiem (2018) woont

Transcript 1 Transcript 2 **Transcript 3** Transcript 4 Transcript 5 Transcript 6 Transcript 7 Transcript 8 Transcript 9 Transcript 10 Transcript 11 Transcript 12 Transcript 13 Transcript 14 ...

Gereed

11:27
5-4-2019

Transcript 5. Interview Mister J. Bleijenberg

Automatisch opslaan | Tree diagram, open and axial coding qualitative test by Schuijt (version 1)(Automatisch hersteld) - Excel | Yvonne Schuijt

Bestand | Start | Invoegen | Pagina-indeling | Formules | Gegevens | Controleren | Beeld | Help | Vertel wat u wilt doen

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A11

1 **Interview Dynamis Strijbosch Thunnissen Mister J. Bleijenberg**

2

3 Person and function: Mister J. Bleijenberg, Broker and valuator

4 Company: Dynamis Strijbosch Thunnissen Arnhem

5 Expertise: Real estate, valuation techniques, effect of developments, benchmarking and urban sustainability.

6 Date: Friday, 1st of January 2019, 09.00 A.M.

7 Place: DEVENTER by phone

8 Duration: 30 minutes

9 Interviewer: Yvonne Schuijt

10 Confidential: Yes

11

12 **Onderzoeker:**

13 Allereerst ontzettend bedankt dat u mij te woord wilt staan. U bent Joost Bleijenberg, makelaar bij Dynamis Strijbosch Thunnissen in Arnhem en ik ben Yvonne Schuijt, student aan Saxion Master Facility and Real Estate Management (MFREM). Ik richt mij op passende waarderingstechnieken met betrekking tot vastgoed van particuliere woningen in een Nederlandse ecologische woonwijk, bekeken vanuit het oogpunt van betrokken belanghebbenden. Van u verneem ik graag uw onafhankelijke expertise op het gebied van ecologische woonwijken en duurzaamheid.

14 **Participant:**

15 Ja, ik ben Joost Bleijenberg, nieuwbouwmakelaar bij Dynamis Strijbosch Thunnissen in Arnhem. Ik ga akkoord met de beantwoording van de verdiepvragen. Ik zie dat je belt met WhatsApp. Kan je mij ook gewoon bellen? M

16 **Onderzoeker:**

17 Gisteren heb ik gesproken met uw collega, de heer Muller van Dynamis Strijbosch Thunnissen in Arnhem. Ik heb begrepen dat Maarten Muller taxateur is. Graag verneem ik van u wat uw rol was bij de totstandkoming van ecologische woonwijk De Kiem.

18 **Participant:**

19 Ja, Maarten Muller doet ook hetzelfde als wat ik doe met nieuwbouw, verkoop en alles wat daar mee te maken heeft. En hij is inderdaad ook nog extra taxateur. Wij verkopen woningen in een deel van ecologische woonwijk De Kiem. ecologische woonwijk De Kiem is best een groot gebied in de wijk Schuytgraaf. En dat bestaat uit allemaal deelgebieden, waar verschillende ontwikkelaars hun product op de markt hebben gebracht. Waar veel makelaars hebben verkocht. En ik heb samen met Roy Boesveld van Willemsen Makelaars, die jij ook kent, heb ik Bouwend Groeien verkocht. En Bouwend Groeien dat waren 8 2 onder 1 kap woningen. En 2 vrijstaande woningen. Dus relatief weinig woningen. Ook met 2 makelaars. Dat was wellicht wat overdreven, maar goed dat was nou eenmaal zo geregeld. En ik heb van Frans Daverveld, de ontwikkelaar, samen met Reuvers Bouw ... Frans Daverveld kan je zien als zelfstandig ontwikkelaar. Die samen met Reuvers Bouw, het project heeft ontwikkeld. Waarbij uiteindelijk Reuvers Bouw is gaan bouwen. En daarbij bij de ontwikkeling van een ecologische woonwijk. Het idee kan wel heel duurzaam zijn, maar pakt de markt dat wel op? Worden de woningen wel verkocht? En daar is wel veel mis gegaan, naar mijn mening. Ook op juridisch vlak moet van alles worden vastgelegd.

Transcript 1 | Transcript 2 | Transcript 3 | Transcript 4 | Transcript 5 | Transcript 6 | Transcript 7 | **Transcript 8** | Transcript 9 | Transcript 10 | Transcript 11 | Transcript 12 | Transcript 13 | Transcript 14

Gereed | 14:07 5-4-2019

Transcript 6. Interview Mister M. Muller

Automatisch opslaan Tree diagram, open and axial coding qualitative test by Schuijt (version 1)(Automatisch hersteld) - Opgeslagen Yvonne Schuijt

Bestand Start Invoegen Pagina-indeling Formules Gegevens Controleren Beeld Help Vertel wat u wilt doen

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A11

1 **Interview Dynamis Strijbosch Thunnissen Mister M. Muller**

2

3 Person and function: Mister M. Muller, CEO, broker and valuator RMT RT MRICS

4 Company: Dynamis Strijbosch Thunnissen Arnhem

5 Expertise: Real estate, valuation techniques, effect of developments, benchmarking and urban sustainability.

6 Date: Thursday, 31th of January 2019, 09.00 A.M.

7 Place: DEVENTER by phone

8 Duration: 60 minutes

9 Interviewer: Yvonne Schuijt

10 Confidential: Yes

11

12 **Onderzoeker:**

13 Allereerst ontzettend bedankt dat u mij te woord wilt staan. U bent Maarten Muller van Dynamis Strijbosch Thunnissen te Arnhem en ik ben Yvonne Schuijt, student aan Saxion MFREM. Ik richt mij op passende waarderingstechnieken met betrekking tot vastgoed van particuliere woningen in een Nederlandse ecologische woonwijk, bekeken vanuit het oogpunt van betrokken belanghebbenden. Van u verneem ik graag uw onafhankelijke expertise op het gebied van ecologische woonwijken, duurzaamheid en passende taxatie technieken.

14 **Participant:**

15 Ja, ik ben Maarten Muller van Dynamis Strijbosch Thunnissen Arnhem. Ik ga akkoord met de beantwoording van de verdiepvragen. Ik ben niet gewend om via WhatsApp te bellen. Maar, dat maakt niet uit. De afspraak staat

16 **Onderzoeker:**

17 Vanuit mijn opleiding is geadviseerd een onafhankelijke taxateur / makelaar te interviewen.

18 **Participant:**

19 Nou, we zijn als makelaarskantoor natuurlijk wel gedeeltelijk betrokken geweest bij de verkoop van woningen van ecologische woonwijk De Kiem. We hebben toch wel 10 woningen verkocht. Dat betreft het project Bouwend Groeien. Wat is het doel van het onderzoek?

20 **Onderzoeker:**

21 Ik probeer af te studeren aan mijn opleiding van Saxion MFREM. En dat wil graag met een ecologische woonwijk als onderwerp. Daarin onderzoek ik de welke taxatie technieken passend zijn voor het taxeren van woningen van een ecologische woonwijk. Graag verneem ik van u wat u definitie is van een ecologische woonwijk?

22 **Participant:**

23 Ja, dat is net zoiets als duurzaamheid en energieneutraal. Ik weet eigenlijk niet exact wat dat inhoudt. Kijk voor mij bekiik ik het vanuit mijn perspectief. Ik taxeer veel woningen. Ik adviseer ontwikkelaars, beleggers

Gereed

Transcript 1 | Transcript 2 | Transcript 3 | Transcript 4 | Transcript 5 | **Transcript 6** | Transcript 7 | Transcript 8 | Transcript 9 | Transcript 10 | Transcript 11 | Transcript 12 | Transcript 13 | Transcript 14

12:54 5-4-2019

Transcript 7. Interview Mister R. Pijnenborgh.

Excel file: Master Thesis tree diagram, open, axial coding, meetings and interviews by Yvonne Schuijt - Opgeslagen

Person and function: Mister R. Pijnenborgh, architect and developer

Interview Archi3o Mister R. Pijnenborgh

Person and function: Mister R. Pijnenborgh, architect and developer

Company: Archi3o 's Hertogenbosch

Expertise: Real estate, effect of developments, benchmarking and urban sustainability.

Date: Friday, 15th of February 2019, 10.00 A.M.

Place: Paardskerkhofweg 6a, 5223 AH 's Hertogenbosch

Duration: 75 minutes

Interviewer: Yvonne Schuijt

Confidential: Yes

Onderzoeker:
Allereerst ontzettend bedankt dat u mij te woord wilt staan. U bent Renz Pijnenborgh, architect van Archiservice en ik ben Yvonne Schuijt, student aan Saxion MFREM. Ik richt mij op passende waarderings technieken met betrekking tot vastgoed van particuliere woningen in Nederlandse ecologische woonwijken, bekeken vanuit het oogpunt van betrokken belanghebbenden. Van u verneem ik graag uw onafhankelijke expertise op het gebied van vastgoed en duurzaamheid.

Participant:
Ja, ik ben Renz Pijnenborgh, architect van Archiservice te 's Hertogenbosch en het project Bewust Wonen Werken Boschveld (BWVB). Ik ga akkoord met de beantwoording van de verdiepingvragen

Participant:
Ik ben architect voor de woningen in deze wijk Bewust Wonen Werken Boschveld (BWVB). Dat is een groepje woningen; het zijn 24 woningen. Even voor mijn beeldvorming. Wil je projecten gaan ontwikkelen voor deze doelgroep?

Onderzoeker:
Nee, dit interview is puur en alleen bedoeld voor mijn afstuderen aan de opleiding Master Facility and Real Estate Management (MFREM) aan Saxion te Deventer.

Participant:
Waarop ga je dan afstuderen?

Onderzoeker:
Ik richt mij op passende waarderings technieken met betrekking tot vastgoed van particuliere woningen in Nederlandse ecologische woonwijken, bekeken vanuit het oogpunt van betrokken belanghebbenden. En mijn vraag aan u is wat een ecologische woonwijk zich onderscheidt van de traditionele bouw in uw beleving?

Transcript 9 | Transcript 10 | Transcript 11 | Transcript 12 | **Transcript 13** | Transcript 14 | Transcript 15 part I | Transcript 15 part II | Transcript 16 | ATASTI & SPSS

15:56 31-5-2019

Transcript 8. Interview Mister A. Bilderbeek

The screenshot displays the Microsoft Excel interface with a Dutch ribbon. The active worksheet contains the following text:

Interview: Dynamis Bilderbeek and partners, valuator mister A. Bilderbeek

Person and function: Mr. A. Bilderbeek, valuator
Company: Dynamis Bilderbeek and partners 's Hertogenbosch
Expertise: Real estate, valuation techniques, effect of developments, benchmarking and urban sustainability.
Date: Friday, 24th of May 2019, 13.00 P.M.
Place: DEVENTER by phone
Duration: 30 minutes
Interviewer: Yvonne Schuijt
Confidential: Yes

Verdiepingsvragen

Nederlandse ecologische woonwijken:

1. Wat onderscheidt de bouw van ecologische woonwijken van de reguliere bouw, volgens u?
2. Kan de bouw van ecologische woonwijken worden vergeleken (benchmark) met de reguliere bouw?
3. Zo ja, welke verschillen zijn hierbij vast te stellen?
4. Volgens Van Hal (2009) kan de samenwerking binnen de reguliere bouw nog veel worden verbeterd. Wat vindt u van de huidige samenwerking binnen de reguliere bouw?

Stedelijke duurzaamheid:

5. Zijn de ontwikkelingen van duurzaamheid bij de bouw van een ecologische woonwijken veranderd ten opzichte van de huidige ecologische woonwijken?
6. Aan welke voorwaarden moet duurzaamheid voldoen bij het bouwen van een ecologische woonwijken, volgens u?
7. Zijn er financiële prikkels om duurzaamheid te bevorderen?

Vastgoed waarderingstechnieken:

8. Wat zijn karakteristieke eigenschappen van ecologische woonwijken die de prijs van de woningen van een ecologische woonwijken beïnvloeden?
9. Welke variabelen van een ecologische woonwijken worden meegenomen bij de waardering van de woningen?

The Excel window title is "Excellfile II Master Thesis tree diagram, open, axial coding, meetings and interviews by Yvonne Schuijt - Excel". The taskbar at the bottom shows the time as 11:01 on 30-5-2019.