

How can Circular Strategies be Implemented in Real Estate Valuation AN EXPLORATORY RESEARCH

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ABSTRACT

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The construction sector, as one of the world's greatest waste generators, is responsible for a cascade of events such as global warming, climate change, and natural resource depletion. Raw materials are continuously extracted from nature, and the rate at which they can refill is insufficient to meet demand. This system suffers significant losses across the value chain (Ellen MacArthur Foundation, 2013). On the contrary, the circular economy concept proposes a circular model of 'reuse-refurbish-recycle' that focuses on reducing waste and optimising resource value retention. The strategy is ideal to adopt in a high-growth, high-waste sector like the built environment. This research was taken up because a significant gap is seen within valuation practices. The current valuation methods, although efficient, collect data and provide property valuations based on previous studies. For example, when using a comparative method of property valuation, we compare one asset with a neighbouring one, that has similar features. This process incorporates the older values already provided to this old building, without accounting for innovations such as re-usability or adaptability of the components. How different would the sector be if we incorporated the value of circular interventions to the original value determined, rather than looking back at older valuation standards? Will there be a significant difference, and, more importantly, would it impact the way real estate investors viewed circularity? In conducting the research, The primary hypothesis of this study was that there is a link between circularity and valuation and that this link can be incorporated within present valuation procedures. The thesis research explains how the connections can be made, as well as specific actual instances for each. The number of possible scenarios is endless.

Keywords: Circular Economy, Circular Design Strategies, Exploratory study, Sustainability, Delphi method & Real Estate Valuation

Introduction

The current prevalent economic design has its origins in the traditionally unequal distribution of resources by geographical area, according to the Ellen MacArthur Foundation (2013). Since developed regions could source consumers as well as materials quite easily, they became the hub for inexpensive materials as compared to the cost of human labour. Hence, business models have been adapted accordingly, wherein the producers were extensively dependent on the use of materials but economised on human labour (Sariatli, F., 2017). The widespread lack of recycling, reusing, and exploitation of waste is the direct byproduct of inexpensive materials and expensive labour. The additional lack of regulatory measures and the usage of a "lock-in inertia" is what led to what is now called the linear economy (Sariatli,

F., 2017). A linear model of consumption of resources follows a 'take-make-dispose' pattern (Ellen MacArthur Foundation, 2013a; Andrews, 2015). This means that the supply chain starts with companies extracting raw materials to manufacture products and ends with a customer who buys the product and disposes of it after its usage. Less importance is given to what happens before and after these stages. This implies that there is a continuous extraction of raw materials from nature, while the pace at which it can replenish is not sufficient to sustain demand. This is a system that is mainly based on usage rather than focusing on the restorative use of natural resources and encounters substantial losses along the value chain (Ellen MacArthur Foundation, 2013). When focused primarily on the construction industry, it is seen that almost a quarter of the output produced by

this industry consisted of waste. This excludes the approximately 11 billion kg produced by the demolition of old buildings (Berkel et al., 2019). The construction sector's waste output was higher than in any other industry in 2016, which means that half of the overall waste production was attributed to this sector. The Netherlands alone produced more waste per inhabitant than the EU's average (Berkel et al., 2019). The World Green Building Council reports that 39 per cent of global carbon emissions are accounted for by the building and construction industry. The built environment is responsible for the bulk of global greenhouse gases and the production of raw materials. Environment performance in cities cannot be increased simply by replacing old buildings with new ones, since both the phases of building and operation cause substantial use of resources and energy. This is already enough of a reason to dwell on the importance of introducing a circular approach within this industry, where the focus is also given to what happens at the end of the economic life-cycle of a product, how they can be reused/ recycled, rather than being disposed of as waste.

Problem Analysis

The challenges faced by the construction and built environment suggests that the industry is ideally positioned to take a lead in the global campaign towards circularity and sustainability. The ethical and environmental reason to do so has a strong stance (Acharya, Boyd, and Finch, 2020). Real estate investors and building clients are important members in helping the drive towards the transition to a circular built environment because they have an opportunity at all stages of a project life cycle to set the course and design of their growth plans, ownership structures, and organisational models for each project. While the market for sustainable buildings has rapidly acquired momentum primarily in the design and construction phases of a project, not much has been done yet by the private sector to translate this demand into the development and investment phase (Myers, G., & Reed, 2007). Most organisations are designed and deeply rooted within the linear approach to growth. Therefore, to venture into circularity, new business cases and revenue models need to be developed, which are free from linear thinking and can give rise to circular principles. For a stakeholder to be driven to accept these additions and reforms, he needs to have substantial reason to do so. The driving factors that would encourage them to adopt circular principles in the real estate sector are yet to be established. While

current practices show that initial investment to incorporate circular practices might be more expensive, stakeholders will not be convinced of it if they do not know the benefits of a higher residual value of a property. To focus on one stakeholder as an example, a valuer is an important member of the real estate industry. If there is a need to incorporate sustainable aspects within a property valuation, he must know how to do so. Hence this report focused on recommendations for a valuator, based on the parameters of valuation. Additionally, it is important to grasp that to reuse a product or a service, first, a market for that product must be created. To create this market, the value of the usable materials must be known. This is where there is a gap between traditional real estate valuation practices versus the ideal scenario where we can consider circularity. The current valuation methods, although efficient, collect data and provide property valuations based on previous studies. For example, when using a comparative method of property valuation, we compare one asset with a neighbouring one, that has similar features. This process incorporates the older values already provided to this old building, without accounting for innovations such as re-usability or adaptability of the components. In some cases, certain older properties are valued based on traditional depreciation, wherein eventually, the building value will be depreciated down to a lower rate, which may consequently disinterest any potential buyers, and make it a non-profitable investment. On the other hand, if the concepts of circularity were considered, where the primary focus is to close the loop and harvest materials, rather than to demolish the building and deem it as added construction waste, then this would make real estate a more sustainable/ wholesome practice. Rather than looking back at older valuation standards, how different would the sector be if we incorporated the value of circular interventions into the original value already calculated? Would there be a drastic difference and most importantly, would it change the way real estate investors looked at circularity? The fact that the value of the property at the end of life is expected to be higher than expected (under normal circumstances), was already incentive enough to consider this transition. To stretch the concept of circularity within the pre-existing valuation methods, it was first vital to understand them well, decipher what lacks, and then create a matrix to see how these could accommodate values of circular principles. Would these be permanent incisions, or very case-specific, or would they have no impact at all? This led to the main

research question.

a. Research Question

This was exploratory research, and the prime objective was to realise how the Real Estate sector can incorporate Circularity within its existing framework, specifically within the valuation of real estate properties. It is important to understand why this research chose to focus on addressing current valuation methods, rather than aiming at providing a new methodology. To create a new methodology, there are various parameters to be considered, in terms of EU regulations, compliance, and discussions with different boards. The focus would then incline towards aligning thoughts and arriving at a final consensus with all stakeholders, which would take a long time. Hence, to enable a smooth transition, it was easier to do so in a familiar domain for valuers, to make it effective and relatable.

For that, the first step was to understand the current methods of valuation and how accepting they would be of interventions that enhance circularity. Simultaneously, it was essential to realise why the Real Estate domain has not already shown substantial progress in terms of making the switch from a linear to a circular model. Once this was established, the next task was to create a bridge between circular principles and valuation standards, to test (via literature, interviews, and surveys) whether circularity could be established within valuation practices or not. Based on all these parameters, the research arrived at the following question.

How can Circular Strategies be implemented in current Real Estate Valuation practices?

Based on this, sub-questions were addressed, which build up to help answer the primary question of the research.

What is the Circular Economy, specifically within the Built Environment?

What are the current methods of Real Estate Valuation for commercial, and office properties, and what is the link with Circularity?

What kind of stakeholders are involved in the process of Real Estate Valuation, and what role do they play in this industry?

What are the primary opportunities and barriers encountered in this transition?

These questions create a much-needed storyline to finally arrive at the main research topic. To know the impact of circular design on real estate values, there

first needs to be clarity about what the circular economy is, what are its principles as well as its applicability in the built environment. The research then dived into a theory about the Dutch investment market, followed by methods of valuation. It was from here that parameters for valuation were extracted and analysed. At this point, a link was created between the two main themes. Since the methodology was based on interviews, it was necessary to explore the type of interviewees and their role in this industry. All this led to a more thorough output for the final research question.

The Oretical Framework

The central idea motivating this research was the concept of Circular Economy (CE). Before delving into the application of CE in the context of Real Estate (RE), it was critical to first grasp the theory's meaning, associated concepts, and the need for such a transformation. This chapter begins with the analysis of CE theory as a basis, followed by a brief literature assessment of its relationship to the built environment and the real estate industry. Finally, the principles are expanded upon in order to make a link with the RE Valuation parameters, which will be discussed in the second half of the theoretical background.

Definition of Circular Economy

The UN's Sustainable Development Goals (United Nations Sustainable Development, 2018) have drawn international attention to the circular economy. The circular economy has the potential to allow for continued economic growth while minimising environmental impact. A shift from a linear to a circular economy has been proposed as a more sustainable model that maximises resource reuse and keeps materials flowing (Advisory Board, 2017; Ellen MacArthur Foundation, 2013). A paradigm shift is needed to transition from a linear to a circular economy. As a result, we must reconsider how we use, manufacture, and design.

Circular Economy (CE) in the built environment is a strategy for reducing waste production and resource depletion (Circle economy, 2017). It is important to carefully plan buildings so that materials always flow in a circular pattern. When it comes to CE in the built environment, it is important to recognise not only new or soon-to-be-built buildings but also existing supplies. According to reports, 75-90 per cent of the current building supply in northern hemisphere countries was still standing in 2015 due to their long lifespan.

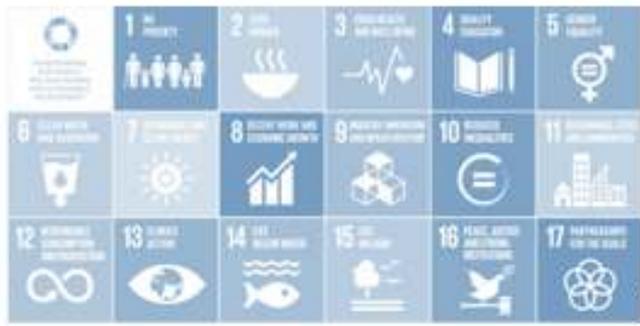


Fig. 1: UN's Sustainable Development Goals (sustainabledevelopment.un.org)

According to reports, approximately 80% of buildings were constructed before the 1960s, implying that the structures would last at least 60-90 years (Pomponi & Moncaster, 2017). As a result, focusing solely on greenfield developments would not suffice if CE were to be realised in buildings. This is where the circular economy will influence how things have been done previously. The figure below depicts how the CE in the built environment would look like.



Fig. 2: What is the Circular Economy; "What is the Circular Economy? | Rediscovery Centre"

Circularity is an economic system that does not allow for the wastage of any materials. Products are engineered and constructed such that they are part of a value network where continuous (re-) exploitation of resources is ensured by reuse and refurbishment at the product, component, and material levels. This is the definition of Circular Economy, as per the World Economic Forum, which is something that must be strived for, in all industries.

The circular economy offers a solution in terms of a circular model of 'reuse-refurbish-recycle' that focuses on reducing waste and maximising resource

value retention. Within a high-growth and high-waste market, such as the built environment, the concept is ideal to implement. When we focus on the built environment, circularity is more than just about the materials that constitute a building. It also tries to incorporate an economic structure where we are more sensitive to the global environment during and after construction, as well as having a focus on a social base.

Therefore, embracing circular economy approaches within the built environment provides a significant opportunity for developers and building clients to reduce lost value sources and thereby increase the financial return from built environment assets, while also taking a significant path to achieve carbon production targets (Acharya, Boyd and Finch, 2020). Circularity is accompanied by concepts or principles, that help translate theoretical definitions into practical examples. There are four broad categories of principles that were identified, which helped set the basis for the further subdivision, to arrive at practical, easy-to-comprehend principles of the Circular Economy that are applied in buildings to make them more sustainable. They are elaborated on below.

Using fewer products, components, resources, and energy during design and manufacture, as well as distribution, use, and recovery, is referred to as **Narrowing**. (Konietzko, J., Bocken, N., & Hultink, E. J.,2020). Translating this to the circular built environment, the term 'narrow' refers to a building's usage of fewer resources over its lifetime. In this regard, the early design phase is crucial, because design decisions have an impact on the performance of buildings and their operations in later stages (Çetin, Sultan & De Wolf, Catherine & Bocken, Nancy.,2021).

Slowing refers to using products, components, and materials longer (Konietzko, J., Bocken, N., & Hultink, E. J.,2020). Through design and operational techniques, the slowing resource loops approach aims to slow down resource flows by intensifying their utilisation and extending their beneficial service life (Çetin, Sultan & De Wolf, Catherine & Bocken, Nancy.,2021).

When buildings reach the end of their useful lives, the closing resource loops principle tries to reintroduce resources into the economic cycle (Çetin, Sultan & De Wolf, Catherine & Bocken, Nancy.,2021).

Regenerating is a type of business that manages and supports natural ecosystem services while also using renewable and nontoxic materials and running on renewable energy. Regenerative architecture is regarded to be the pin-nacle of architectural sustainability, going beyond green and sustainable building ideals to provide self-sufficient, continuous flows of resources, in which human-nature co-evolutionary systems are begun based on the features of the location (Çetin, Sultan & De Wolf, Catherine & Bocken, Nancy.,2021).

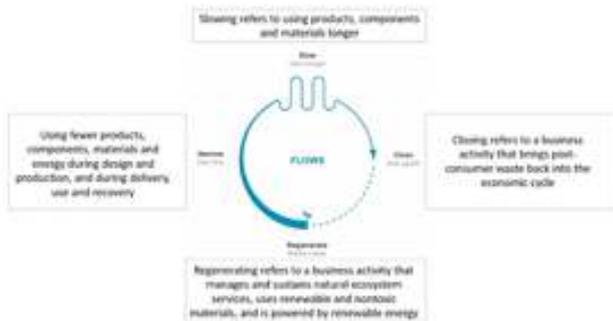


Fig. 3: Principles of the Circular Economy; Çetin, Sultan & De Wolf, Catherine & Bocken, Nancy.,2021 Each of these design strategies can further be sub-categorised into 8 building principles (Copper8, 2021).

Scenarios of how each of them was applied in the research are elaborated upon below as well.

Regenerate

Increase the quantity of (sustainable) bio-based materials

Maximize the potential for high-quality reuse, if materials are appropriate for reuse due to their high quality or lack of harmful substances, for example.

Narrow

Use as little material as possible to reduce the amount of raw resources consumed.

Reduce the amount of 'new' (virgin) material used.

Slow

Design for maximum functional life.

Design for optimal use and maintenance.

Close

Design for future life cycles.

Increase the amount of recycled material while retaining the value of products and materials that have been discharged.

Although there are different ways in which principles can be worded, the above list is a comprehensive set of circular building principles that are used in one or more ways in different sustainable projects. Each of them has already been analyzed to understand how they can be measured, and are practically oriented so

they can be applied directly in projects. The principles focus on most parameters of de-sign, including the usage of adequate materials, flexibility, adaptability, building harvesting, an extension of usability, and re-usability, among others.

Real Estate Valuation

The second part of the literature review emphasised Real Estate in the Netherlands and its valuation practices. The focus was on Dutch Commercial Markets and their methods of valuation. Once this was clear, a description of the importance of the inclusion of Circularity in this domain was elucidated.

What is a property and the Economic Role of Valuators in Real Property Markets?

Real property is a particular economic good that differs significantly from other economic goods. To start with, Real Estate is described as a specific piece of land on the Earth's surface, as well as the semi-permanently attached items such as houses, trees, soil, and subsoil assets such as underground storage tanks (Bartke, Stephan, 2015). Real property encompasses all the interests that are linked to the property, in addition to the real estate itself. Future usage rights, lease rights, and easements are examples.

The real estate industry is heavily regulated around the world. There is almost no other good whose property rights are so well-defined and closely regulated, such as by public zoning laws. The exclusivity and singularity of a piece of land within an ecosystem (that may change over time) determine its usability, which affects its economic value.

Real estate is an economic good for which given property rights exist and are implemented in most parts of the world. As a result, for property to be exchanged between individuals, a safe 'legal environment for real estate transactions is needed. This environment can be called a property market. According to its legal framework, the real estate sector can be divided into residential, commercial, and public interests, as well as different sub-markets.

Decentralised trade characterises all these markets, particularly when a piece of real estate is to be used for building or cultivation rather than just as a financial investment. Furthermore, since real estate necessitates long-term, large-scale investments, it is not purchased (or sold) daily, especially when compared to consumer goods. As a result, we have markets where trade occurs in a relatively irregular manner. As a result, neither fair expectations nor a clear market point can be found among individual buyers or sellers; in other words, assets are

exchanged in multiple dispersed locations rather than a single central location like a stock exchange, and this trade is characterised by complexity.

The Dutch Investment Market

When focused on the Dutch Investment Market, within conti-nental Europe, the Netherlands is the third most popular des-tination for real estate investors. There are signals that for-eign investors will continue to favour the Netherlands. The openness of the Dutch real estate market, the country's strong economy, and the fact that prices remain competitive as com- pared to neighbouring countries all contribute to this ongoing interest.

Concerning sustainable real estate, investments have been gaining traction around the world, though the rate of adop- tion varies by country. For institutional investors, the value of impact investing and Environmental and Social Gover-nance (ESG) guidelines is growing, and Dutch players are at the forefront of this trend. Global awareness of the need to reduce CO2 emissions is increasing, and businesses and organisations in the built environment in the Netherlands are working to adapt. The demands to adapt to the challenges of climate change, climate adaptation is both a challenge and an opportunity.

To make considerable progress in the investment of sustain- able buildings, however, the investment industry requires substantial financial proof, which can only be achieved by modifying the valuation technique to appropriately analyse sustainable office buildings. Evidence on the economic ben-efits of sustainable property investment is needed to persuade business practices, educate public discourse, and transform sustainable building markets, according to Lorenz (2007a). Investors need to know their estimated return on investment, expected income stream, and market value or selling price of their asset (Myers, Reed, and Robinson, 2008). All these variables influence investment decisions.

Process of Valuation

A value can be assigned to any commodity. A valuation is the result of a process that determines its value. This can be rather simple in some cases. Most consumer products, for example, do not require an expert to determine their market value because they can be utilised right away and compared. In other situations, determining value necessitates a higher

level of expertise and experience. When seeking to capture the value of a property, this is the case: no two buildings are exactly the same, and benefits from property ownership or interests are often realised over extended periods.

Even though valuations have become more sophisticated, and the underlying process has vastly improved in consistency and transparency, valuation purposes and methods have re-mained largely unchanged in recent decades; a valuer still typically provides a client with a single number, often an estimate of market value, or an opinion of value, which is pro-vided under certain circumstances or scenarios and is often a variation of the market value.

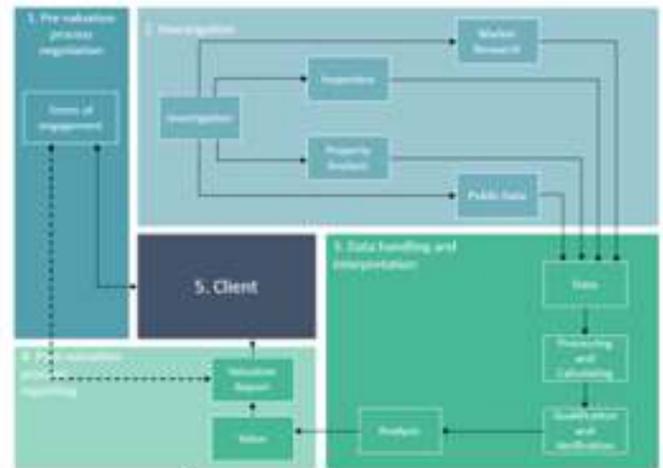


Fig. 4: Valuation process; own figure; Adapted from Scheurwater,

S. (2017). The Future of Valuations The relevance of real estate valuations for institutional investors and banks – views from a European expert group. Royal Institution of Chartered Surveyors (RICS).

The valuation process begins when a client asks for one and ends when the value is determined and reported. The figure above depicts the many stages of the valuation process at a high level.

Parameters of Valuation

Although each method of valuation seems rigid, with no room for manoeuvre and inclusion of new elements, the key lies in extracting each valuation parameter, where the scope for interventions and broader definition could be applied. The purpose of

the research was not to suggest/alter the existing methods of valuations as they have a strong basis but to broaden their scope of definition by selecting the right location to do so, which is via the parameters.

Every property valuation process is conducted based on certain parameters that are analysed, which then leads to a final value for the property. These are the basis on which research is done, evidence is collected and finally interpreted by valuers. This indicates that the entire process is not automated, but a significant weightage of a property value can be attributed to the characteristics and experience of a valuator. He is the middleman and the one who interprets the parameters to arrive at a value.

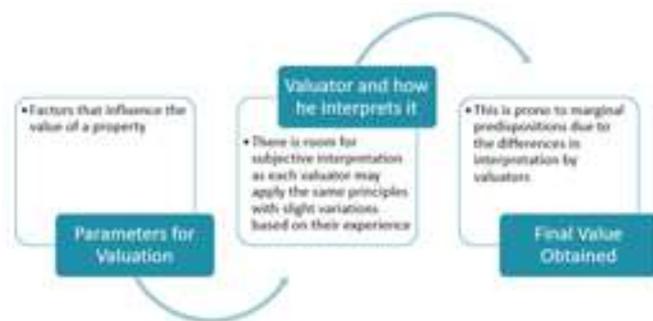


Fig. 5: Role of Valuator; own figure

Certain parameters are accounted for in all types of appraisal methods, but they may differ based on the type of appraisal done, the purpose of the appraisal, and sometimes on the appraiser themselves. These were important to identify because once there is an understanding of what drives the market value and on what basis is a property evaluation conducted, missing links or leeway to circular inclusions could be found. Additionally, this would provide a basis for exploring where the obstacles and opportunities to circularity lie within these parameters.

Research Method: Delphi Tech - Nique

Since in this project, the understanding of what already exists played a vital role, the most appropriate way to decipher what real estate investors/valuators have to say about introducing circularity was by conducting interviews and questionnaires. This way, there is an understanding of what stage each company is at, along with what their interpretation of circularity is. Such interactions also enabled an evaluation of why certain methodologies have not been adopted yet or did not provide the desired output.

A data collection for decision-making among

isolated, anonymous respondents is the Delphi method. The Delphi technique, named after the oracle Delphi, enlists the help of subject-matter experts (Sackman, 1975). The method aims to reach a consensus among these experts through several rounds of interviews and questionnaires (Campbell & Cantrill et al., 2001, p. 7). The RAND Corporation designed the system in the 1950s and 1960s to efficiently gather and synthesize expert opinions. It is used for future decision-making, planning, and policy analysis (Gordon & Pease, 2006). The approach is often used in cases where there is a lack of consensus or significant ambiguity (Sourani & Sohail, 2015). Furthermore, Sourani and Sohail (2015) defined this as a method for obtaining information that is expensive or even inaccessible, for dealing with complex problems, and for combining fragmented knowledge from various insights to achieve a collective understanding.

Discussion and Conclusion

This study investigated the problem of not being able to demonstrate a translation of circular interventions into a property valuation segment, and hence no influence on the final value. The findings of this study suggest that there may be a link between circular principles and property valuation characteristics. The main research question which has guided this study was: “How can Circular Strategies be implemented in Real Estate Valuation practices?”

The link between circular principles and valuations that are presented in the analysis is a first start to explore how Circular Strategies be considered in Real Estate Valuation Practices. Before this research, there have been methodologies and studies that reinstated the need for circular value, as well as elaborated on various circular business models that could potentially add value. The paper by the Arup and Ellen MacArthur Foundation, titled, “From Principles to Practises: Realising the Value of Circular Economy in Real Estate”, was a key stepping stone to arriving at this research. The primary difference is that the paper by Arup focused on specific business models of the circular economy, that when applied to building practices, could have an advantage in terms of value. But the scope was limited to those selected circular model strategies. In this research, the focus is on real estate valuation practices, and what the impact of circular principles would be on their fixed parameters of valuation. This provides opportunities for the expansion of different case scenarios of circularity, as once they are identified under one or

more circular strategies, the impact on the valuation parameter can be easily discovered. Below is a short description of the findings related to each link.

While most valuers did see a potential link between most of the circular principles mentioned, the one where they still had their doubts was with respect to the link between interest and vacancy rates. To elucidate on one, from literature as well, the definition and the usage of interest rates for valuation purposes are varied. Usually, an increase in the interest rate means a drop in the property value. But fundamentally, the increase in the interest rate off late is a sign of economic growth, which means that it will lead to higher demand for spaces, and higher rents, and will then offset interest rates. Hence while the research has managed to exhibit a good explanation of how interest rates work, the link with circularity has not been so successful yet. Thus, as a further recommendation to the research, it would be valuable to align those connections in order, so that the list presented is then more complete.

With respect to the vacancy rate, it did not receive as much consent as the other parameters. But this means that there is more scope for research in terms of how vacancy rates can be positively impacted by the circular economy. According to the researcher, the vacancy rate is a prime parameter for calculating commercial properties using the income method, where the potential income of the building is assessed, to determine what the building should be valued at. A higher vacancy rate determines lower income, leading to a lower valuation of the property. On the other side, circular principles such as adaptability and maximising the number of life cycles enable the rapidly changing needs for meetings or spaces. Additionally, different tenants require different configurations, and this is where modular and re-organizable components will have an advantage, leading to shorter 'vacant' periods between two rentals. Furthermore, there can be scenarios where tenants require flexible spaces for their marketing and image, for certain exhibits like 'popup shops' or 'weekly markets. Here, they would be willing to pay higher for the space, leading to a higher property valuation.

Conversely, other factors such as costs, higher rent/income, as well as time frame have managed to show connections with a few circular design strategies and received majority consent as well. Another conclusion drawn from this research is that

various companies that are involved in sustainable design are in it because they believe in the need for the transition, as well as the branding and image of the company. This is at present of higher value to them, as it has the potential to steer the economy. They believe that the demand for sustainable buildings will raise its value until the industry can match up to these demands. At present, no one has visible financial incentives yet. For them, they are aware of ways in which the world is changing and advancing, and their priority is to be forerunners in the industry and to be prepared for the government legislation to arrive. They visualise that the future will head towards stronger sustainable principles, and they do not want to fall behind in this transition. Hence, a lot of sustainable as well as circular buildings are made to serve as prototypes for the future. Using these prototypes, financial implications can be sought, and the effect on the value of a property can have substantial proof and backing. They can view the progress live, along with issues faced, which can be addressed and serve as further information for future projects. Thus, even though there are no visible financial benefits yet, they will be available in the future, and the research enables valuers to keep a lookout for circular design strategies that can be implemented.

Additionally, when trying to realise the link between circularity and valuation, we tend to forget that circularity is a component of sustainability, and if treated like that, it makes matters clearer for all stakeholders to comprehend and consider implementing. Each project or industry cannot be 100% circular yet, but it can be strongly sustainable, by applying components of circularity that befit the project. This reduces the pressure and unawareness about implementing something unknown, with a modification in framing the definitions.

With deeper introspection into the main theme and the conclusions drawn from the analysis of each parameter, it was determined that valuation parameters can be divided into subjective and objective. Objective means data backed by substantial, tangible proof, whereas subjective considerations rely partially on the perspective of the individual evaluating the property. This was an interesting finding upon interacting with experienced valuers in the Netherlands. They emphasised the fact that although they try to make valuations as objective as possible, in the end, it is the signature of the valuator on the report. Hence, his

experience and expertise play a role in the evaluation process. The 'subjective' parameters were verified by valuers before establishing connections with circular principles. The description of the links was also verified by several valuers across the Netherlands, and the validity and definitions of the circular principles were discussed and validated by Circular consultants from Cop-per8, who also have backgrounds varying from Architecture, Sustainability, and the Policy-making sector. This gives the outcome a higher weightage than it would without their opinions and input.

Additionally, because this report is intended for a valuator, it is important to address the implications for them. Although there are no specific skills needed to incorporate the recommended inclusions, it would be easier to incorporate them in practice if valuers are more susceptible to inclusions and are more accepting of them. The pattern of the focus of valuations changes slightly in terms of more elaborate discussions in the subjective area. Deliberations either among themselves or with clients about how each parameter can be impacted can aid in perceiving the client's opinion of what a 'value' entails, or even what their opinion of the value is. There have been a few instances where investors purchased a circular building at a higher rate than the actual written value, only because they believed that the building had great potential and would reap benefits. This higher value did not show in any financial institutions, but it will impact the way the market sees the value to be.

Although this research was intended for a valuator, the findings can be useful to developers as well. The same guidelines would prove beneficial for developers at the design and construction stage of the project since they will have some idea of the

implication of circular design strategies on their transactional value post-construction. It can serve as an incentive for them to implement circular practices since they will now know that there are possibilities of seeing its worth. The research enabled developers with more confidence to take the risk of higher investments due to sustainable and circular practices. This research also helped in the shift from 'looking back' to older comparables and standards towards a more 'forward' outlook. The approach with which a property is valued is then more wholesome, keeping in mind the predictions for the future. This was one of the primary reasons the research was chosen because all valuers currently look back at similar, already valued properties. The current methods do not account for the changing standards and regulations that the government aims to incorporate. A live case where it came to light that looking back at comparables does not always help is with the onset of COVID-19. It shook the real estate market, and the usually high-demand commercial spaces fell vacant. This eventually reflected in the value as well, but it was not due to any analysis or comparables, but because of the unforeseen scenario. It nudged valuers to see that not all predictions can be perfect, and situations like this bring in some room for amendments.

Finally, as an 'end product' of the entire analysis and research, there is a short manual that has been prepared for Valuers. It briefly discusses each circular design principle, its impact on different parameters of valuation, an example of each, as well as a simple formula explaining the impact. This would serve as a quick checklist for valuers.

a. The link between Valuation parameters and Circular Principles

		Calculation/ Financial Parameters				
		Interest Rate	Costs	Income	Vacancy Rate	Time Frame
Circular Principles	Maximize the amount of sustainable bio-based materials	Green loans (lower interest rates) allotted by banks	Higher investment costs, lower operational costs	Higher savings → larger profit → higher income		Longer duration of time needed to earn back investments.
	Maximize the potential for high-quality reuse.			Adaptability to client requirements implies lower vacancy rate, leading to more consistent income	Due to ease of adaptability to client requirements, vacancy rate is lower, leading to higher valuation	

<i>Design with minimum amount of materials</i>		Lower costs due to lower materials to be purchased			
<i>Minimize the amount of new (virgin) materials</i>	High interest rates lead to lesser amount of components.	Helps investor mitigate risks related to increasing costs of traditional materials (due to scarcity)			
<i>Design for maximum functional lifetime</i>		Higher investment, but lower costs due to reduced need for relocation, renovation and repairs		Due to ease of adaptability to client requirements, vacancy rate is lower, leading to higher valuation	
<i>Design for optimum management and maintenance</i>		Higher investment, but lower costs due to reduced need for relocation, renovation and repairs	Adaptability to client requirements implies lower vacancy rate, leading to more consistent income	Due to ease of adaptability to client requirements, vacancy rate is lower, leading to higher valuation	
<i>Design for multiple lifecycles</i>		Higher investment, but lower costs due to reduced need for relocation, renovation and repairs	Design and usage for longer duration ensures steady income for a long period of time	Due to ease of adaptability to client requirements, vacancy rate is lower, leading to higher valuation	The time frame for valuation cash flows can be longer for adaptable structures. Hence, the influence of sustainable decisions can be visible
<i>Maximize the amount of reused materials</i>	High interest rates lead to lesser amount of components.	Lower costs due to lower materials to be purchased			
To what extent is it agreed upon?	3,904761905	4,19047619	4,047619048	3,857142857	4,095238095

Fig. 6: Matrix describing how Circular Principles can have an impact on Valuation Parameters

I. Limitations and Recommendations

It should be noted that, as a relatively new concept, the circular economy has a variety of definitions and interpretations. This can make it ambiguous for the user and lead to uncertainty about what the true principles of the circular economy are. The definition of the circular economy, as well as the principles that will be studied, has been elaborated in the theoretical background for this research. They encompass the practical domain of how Circular principles are used in real projects. This study investigates how valuers can evaluate circular design techniques given their present set of already existing parameters. Because the interpretation of valuers is so important, the recommendations investigated may not be carried out in the same way as the researcher intended. As this is an exploratory study, the linkages offered are merely suggestions that the valuer can follow or use as a starting point for additional research in the field of circular values. The examples and scenarios provided are not intended to be followed exactly as written, but rather to help valuers, developers, and investors familiarise themselves with the Circular

economy and see the potential for a change in value. Concerning further recommendations, it might be worthwhile to investigate creating a refined framework of all the strategies elaborated on, and then conduct action-based research to back up the solutions presented here. This study was an exploration, and while the suggested solutions have been validated by experts, putting them into practice requires additional layers before they are concretized. As a result, valuers can begin by looking at case studies of circular buildings to see how circular principles will affect their value reports. A strong recommendation would be to do a thorough investigation into the government's circularity policies and their consequences for value and then make recommendations to them. The study uncovered several intriguing proposals for the government to implement sustainability rules. It would stimulate faster change dynamics if those were communicated to municipal bodies. Strict government regulations governing stakeholder recommendations in all sectors can aid in the adoption of the circular economy.

References

- Acharya, D., Boyd, R. and Finch, O., 2020. FROM PRINCIPLES TO PRACTICES: REALISING THE VALUE OF CIRCULAR ECONOMY IN REAL ESTATE. [ebook]
- Netherlands: Ellen Macarthur Foundation and Arup. Achterberg, E., Hinfelaar, J., & Bocken, N. (2016). MASTER CIRCULAR BUSINESS WITH THE VALUE HILL.
- Circle Economy. Retrieved from https://assets.website-files.com/5d26d80e8836af2d12ed1269/5dea74fe88e8a5c63e2c7121_inance-white-paper-20160923.pdf
- Alina Nichiforeanu, 2017. "The interests of stakeholders when valuating commercial property," *ERES* 2017, 62, *European Real Estate Society (ERES)*
- Architecture2030.org. 2019. New Buildings: Embodied Carbon – Architecture 2030. [online] Available at: <https://architecture2030.org/new-buildings-embodied/>
- Bank, I. N. G. (2015). Rethinking finance in a circular economy. Financial Implications of Circular Business Models.
- Bartke, Stephan & Schwarze, Reimund. (2015). The economic role of valuers in real property markets - UFZ Discussion Papers 13/2015. 10.13140/RG.2.1.4318.5367.
- Bosma, M., Theuvenet, G. and Landkroon, J., 2020. Bouwinvest Dutch Real Estate Market Outlook 2020-2022. [online] Bouwinvest.nl. Available at: <https://www.bouwinvest.nl/media/4305/bouwinvest-dutch-real-estate-market-outlook-2020-2022.pdf>
- Bouwinvest.com. n.d. The playing field for real estate investors in the Netherlands. [online] Available at: <https://www.bouwinvest.com/media/3991/bouwinvest-trends-and-developments-dutch-real-estate-market-2019-2021.pdf>
- Bouwinvest-annualreports2017.com. 2017. Stakeholders' matrix | Bouwinvest 2017 - Real Estate Investment Management. [online] Available at: <https://www.bouwinvest-annualreports2017.com/reim/appendix4/stakeholdersmatrix3/a1566Stakeholders>
- Çetin, Sultan & De Wolf, Catherine & Bocken, Nancy. (2021). Circular Digital Built Environment: An Emerging Framework. Sustainability. 13. 10.3390/su13116348.
- Chen, J. and Anderson, S., 2020. What Is a Vacancy Rate? [online] Investopedia. Available at: <https://www.investopedia.com/terms/v/vacancy-rate.asp>
- Cohen, D., & Crabtree, B. (2006, July). Semi-structured Interviews. Retrieved from Qualitative Research Guidelines Project: <http://www.qualres.org/HomeSemi-3629.html>
- Corporate Finance Institute. n.d. Market Approach - Methods, Uses, Advantages and Disadvantages. [online] Available at: <https://corporatefinanceinstitute.com/resources/knowledge/valuation/market-approach-valuation/>
- E. Kennedy, K., 2019. Commercial Real Estate Value Factors NAS Investment Solutions. [online] NAS Investment Solutions. Available at: <https://www.nasinvestmentsolutions.com/article-commercial-real-estate-value-factors>
- Eichholtz, P., Kok, N. and Quigley, J., 2011. THE ECONOMICS OF GREEN BUILDING. PROGRAM ON HOUSING AND URBAN POLICY. Institute of Business and Economic Research.
- Ellison, L. and Sayce, S., 2007. Assessing sustainability in the existing commercial property stock. Property Management, 25(3), pp.287-304.
- Gunhan, S., & Arditi, D. (2005). Factors Affecting International Construction. Journal of Construction Engineering and Management, 131(3), 273-282. doi:10.1061/(ASCE)0733-9364(2005)131:3(273)
- Hamilton, I. and Raph, O., 2020. Towards a zero-emissions, efficient and resilient buildings and

- construction sector. GLOBAL STATUS REPORT FOR BUILDINGS AND CONSTRUCTION. [online] Global Alliance for Buildings and Construction.
- Hartenberger, Ursula & Lorenz, David. (2008). Breaking the Vicious Circle of Blame – Making the Business Case for Sustainable Buildings.
- Hoesli, M., & MacGregor, B. D. (1997). European Real Estate Research and Education: Development, Globalization, and Maturity. *Journal of Real Estate Finance and Economics*, 15(1), 5-9.
- IEA (2019), Multiple Benefits of Energy Efficiency, IEA, Paris <https://www.iea.org/reports/multiple-benefits-of-energy-efficiency> -International Energy Agency and the United Nations Environment Programme, 2018 Global Status Report: Towards a Zero Emission, Efficient and Resilient Buildings and Construction Sector, 2018
- Kirchherr, J., Reike, D., & Hekkert, M. (2017). Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, conservation, and recycling*, 127, 221-232.
- Klein, T., Bilow, M., Sabbe, A. and Smit, M., et al., n.d. Circular Economy for a Sustainable Built Environment.
- Konietzko, Jan & Bocken, Nancy & Hultink, Erik. (2020). Circular Ecosystem Innovation: An Initial Set Of Principles. *Journal of Cleaner Production*. 253. 119942. 10.1016/j.jclepro.2019.119942.
- Kupec, Josef & Dlask, Petr. (2020). Residual method used for commercial real estate valuation and its sensitivity. *Business IT*. X. 12-21. 10.14311/bit.2020.02.02.
- Lawrence, J. (2014). Supply and Demand in Property Investment. Retrieved 6 August 2021, from <https://blog.realestateinvestar.com.au/property-investing-supply-and-demand>
- Lee, I., 2019. Real estate and the challenge of the circular economy. [Blog] MIPIMWorld Blog, Available at: <https://blog.mipimworld.com/innovation/real-estate-the-challenge-circular-economy/>
- Li Ping, H., Jemes, J., Kian Fung, L., Pei Yin, N., Aiza Maidin, N. and Shahril Abdul Rahman, M., 2019. Factors Affecting Commercial Property Value. [online] Ijstr.org. Available at: <http://www.ijstr.org/finalprint/dec2019/Factors-Affecting-Commercial-Property-Value.pdf>
- Maria Trojanek, The Application of Income Approach in Property Valuation in Poland, *Economics & Sociology*, Vol. 3, No 2, 2010, pp. 35-47.
- Myers, G., Reed, R. and Robinson, J., 2008. Investor Perception of the Business Case for Sustainable Office Buildings: evidence from New Zealand. In: 14th Annual Pacific Rim Real Estate Society Conference 2008. Kuala Lumpur: 14th Annual Pacific Rim Real Estate Society Conference 2008.
- Moloney, P. (2021). Capturing value in the circular economy. Retrieved from <https://ramboll.com/ingenuity/capturing-value-in-the-circular-economy>
- Nguyen, J., 2019. 4 Key Factors That Drive the Real Estate Market. [online] Investopedia. Available at: <https://www.investopedia.com/articles/mortgages-real-estate/11/factors-affecting-real-estate-market.asp>
- Oram, P., 2019. The office of the future should be circular. [Blog] Insight, Available at: <https://workplaceinsight.net/the-office-of-the-future-should-be-circular/>
- Pagourtzi, Elli & Assimakopoulos, Vassilis & Hatzichristos, Thomas & French, Nick. (2003). Real estate appraisal: A review of valuation methods. *Journal of Property Investment & Finance*. 21. 383-401. 10.1108/14635780310483656.
- Properties and Pathways. n.d. The key three property drivers. [online] Available at: <https://propertiesandpathways.com.au/3-key-drivers-of-the-commercial-real-estate-market/>
- Sagalyn, Lynne. "Real Estate Risk and the Business Cycle: Evidence from Security Markets." *Journal of Real Estate Research* 5, no. 2

(Summer 1990): 203-219.

Segal, T. (2019). How Interest Rates Affect Property Values. Retrieved 23 July 2021, from <https://www.investopedia.com/articles/mortgages-real-estate/08/interest-rates-affect-property-values.asp>

SAYCE, Sarah et al. Real estate appraisal: from value to worth. 1st ed. Oxford: Blackwell, 2006. 340 s. ISBN 1- 4051-0001-X.)

Schoolderman, H., Dungen, P. v., Beukel, J.-W. v., Raak, R. v., Loorbach, D., Eijk, F. v., Joustra, D. J. (2014). ondernemen in de circulaire economie - nieuwe verdienmodellen voor bedrijven en ondernemers. Amsterdam: OPAi & MVO Nederland.

Sethi, A., 2021. Council Post: Achieving A Circular Economy In Real Estate. [online] Forbes. Available at: <https://www.forbes.com/sites/forbesrealestatecouncil/2021/03/10/achieving-a-circular-economy-in-real-estate/>

Shapiro, E., Mackmin, D. and Sams, G., n.d. Modern methods of valuation. 11th ed. EG books, p.36.

Scheurwater, S. (2017). The Future of Valuations The relevance of real estate valuations for institutional investors and banks – views from a European expert group. Royal Institution Of Chartered Surveyors (RICS). Retrieved from <https://www.rics.org/globalassets/rics-website/media/knowledge/research/insights/future-of-valuations-insights-paper-rics.pdf>

Smith, L. W. (2000). Stakeholder analysis: a pivotal practice of successful projects. Paper presented at Project Management Institute Annual Seminars & Symposium, Houston, TX. Newtown Square, PA: Project Management Institute.

Trojanek, M., 2010. THE APPLICATION OF INCOME APPROACH IN PROPERTY VALUATION IN POLAND. Economics & Sociology, 3(2), pp.35-47.

Wautelet, Thibaut. (2018). The Concept of Circular Economy: its Origins and its Evolution. 10.13140/RG.2.2.17021.87523.

WYATT, Peter. Property Valuation in an Economic Context, First edition. Blackwell Publishing Ltd, 2007, ISBN 978-1- 4051-3045-5)

Zvirgzdins, J., Plotka, K., & Geipele, S. (2019). Circular economy in built environment and real estate industry.