ROTTERDAM'S TRANSFORMATION POTENTIAL

TRANSFORMING STRUCTURAL
VACANT OFFICE SPACE
INTO HOUSING

COLOPHON

P5 Research Report

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Preface

This report presents my graduation thesis towards the transformation potential of Rotterdam's vacant office space into housing. This master thesis is the final assignment for the master track Management in the Built Environment at the Delft University of Technology.

R.A. de Ridder

Rotterdam, 2018

Executive Summary

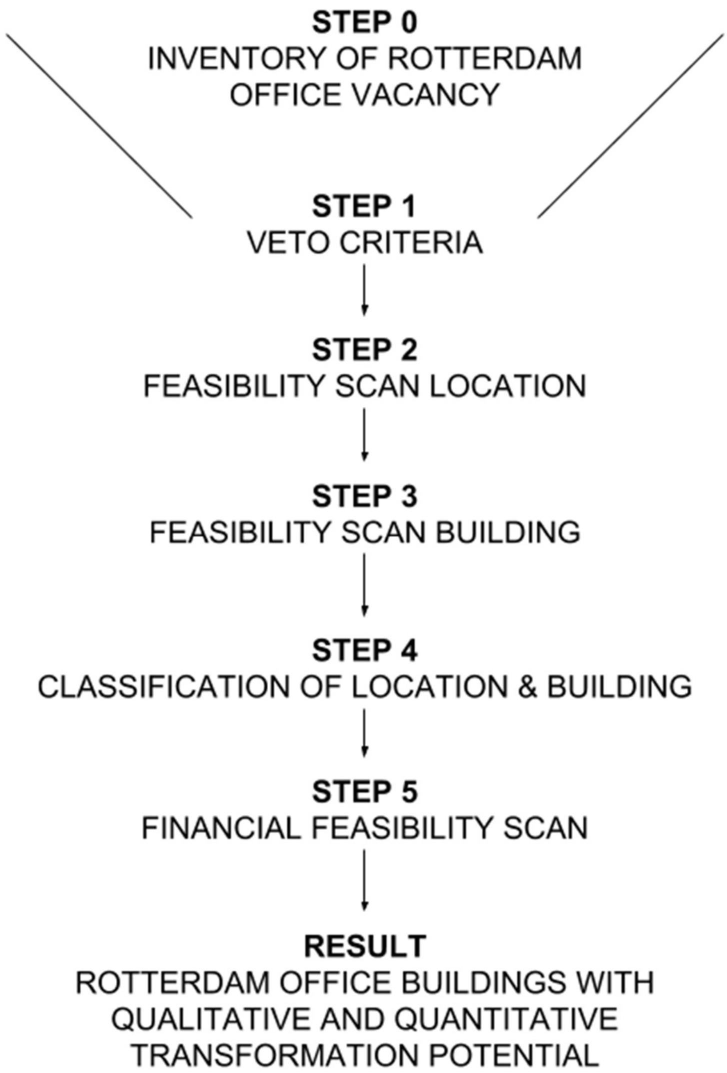
This research aims to uncover the transformation potential of the structural vacant office space in Rotterdam to residential space. The office market in the Netherlands has become a replacement market. The result of this replacement market is that users can choose to rent the highest quality offices at the best locations due to the surplus of space. Of all major cities, the city of Rotterdam is coping with the highest vacancy rates. In this city 18,7% of its total office stock was recorded as vacant on January 1st, 2017 (PBL, 2017). Not all vacancy is considered to be a problem. Within the real estate literature, a distinction is made between initial and friction vacancy (vacancy less than one year), long-term vacancy (vacancy between one and three years) and structural vacancy (vacancy more than three years) (Buitelaar et. al, 2013). For the office market to function optimally about 4 to 6% should remain frictionally vacant (Zuidema, 2010). Of these three vacancy categories, structural vacancy has increased considerably in recent years to 65% on January 1st, 2017. This is a problematic development. Structural vacancy is problematic because these objects will not be taken up by a rising economy (Remoy, 2014). In other words, without some sort of intervention these buildings will remain vacant with all its associated financial and social consequences. This quantitative and qualitative mismatch results in an increase of structural vacancy at the bottom end of the market. This mismatch of demand and supply is not just an issue within the Dutch office market but also for the housing market. The difference between the two markets however is that the office market is coping with an oversupply and the housing market with a shortage, especially in the Randstad area where space is scarce. This increasing demand is caused by the migration to the cities, households becoming smaller, and insufficient building production in recent years (NOS, 2017). These signs of an overheating housing market are also showing in the city of Rotterdam which is also located within the Randstad. Here prices have risen significantly and, on some locations in the city, have already surpassed those of before the economic crisis in 2008 (NVM, 2018).

There are several intervention strategies to cope with office vacancy. The options are selling, consolidation, renovation, demolition and build new, or transformation. However, by just selling the object the problem is not solved. The same goes for consolidation, as mentioned before, waiting for a rising economy will not be a solution. By renovating the building, the quality is improved of the original office function, however this function is most likely no longer desired on its location since it is structurally vacant. Function change is the most viable solution and can be obtained by either demolition and new build or transformation. Using this intervention method structural office vacancy may be reduced, and supply is added to its overheating housing market. However not all buildings are suitable for transformation. This is related to several influencing factors related to market-, location-, and building characteristics. The Rotterdam office market may offer possibilities to reduce structural vacancy by way of transformation due to possible favorable characteristics. Many tools have been developed aiming to incorporate these factors. To test this transformation potential of Rotterdam's structural vacant office space with an improved assessment tool which combines among others the aforementioned influencing factors the following main question is posed:

> *In what way and to what extent can current transformation tools measure Rotterdam's transformation potential of structural vacant office space towards housing?*

After analyzing a variety of transformation tools, the tool that has proven to be best suited to assess Rotterdam structural office vacancy for its transformation potential towards housing is an adapted version of the Conversion Meter 2017 from Geraerdts et. al (2017), the Conversion Meter Rotterdam 2018. This tool made it possible to assign a score to the market, location and building characteristics. The transformation potential could then be ranked and given a classification. With the use of this tool also a first financial feasibility study can be made.

The adaptations made to the original tool are not necessarily on the structure of the tool. The systematic step-by-step approach from broad to detailed remained the same. The content of each step was altered. In some steps more than others. The biggest adaptation was separating the feasibility scan of location and building. In the original tool this was done in one single step. The location however is of more importance to the success of transformation projects compared to the building. A transformation project with a good location and a bad building can still become a successful project. However, a bad location with a good building will most likely result in a bad project.



Steps of the Conversion Meter Rotterdam 2018

To test and rank Rotterdam's vacant office space, first an inventory was made of all vacant office space. Using various publicly available sources a database was made listing all vacant office buildings in Rotterdam with location and building characteristics needed to assess its transformation potential using the Conversion Meter Rotterdam 2018. This is the input for step 0. In Rotterdam 376 buildings were recorded as (partly) vacant. Of these 376 buildings, 142 were recorded as frictional vacant, 172 long term vacant and 62 as structural vacant. Only the 62 structural vacant office buildings were tested for their transformation potential since the use for office space here is redundant.

After running all 62 buildings through all 5 steps, 38 building could potentially be transformed successfully into housing. Six buildings received a classification of excellent transformation potential, 32 are considered to have high transformation potential and 24 have no transformation potential.

These high and excellent potentials are located in or close to the city center as experts had already claimed. However, 17 of the “no potentials” were located in the city center. This favorable location for transformation has been made unfavorable by municipal policy. These 17 centrally located offices are in the middle of designated office areas. Upgrading of this office space is a better solution for this structural vacancy, because a change in zoning plan is most likely to be denied. Apart from half the office space being located near the city center there are more aspects for transformations to be successful. With considering these other aspects it is said that 50% is suitable for transformation. Looking at number of structural vacant buildings in Rotterdam, 33 out of 62, this is confirmed by the empirical outcome. However, if this is calculated using floor space, the 50% is not reached. The total floor space of all structural vacant offices combined amounts to 619.621m^2. The floor space that is suitable for transformation after quantitatively and qualitatively testing amounts 218.091m^2. This is 35.2%. This is caused by the large office buildings located in the office district. These buildings are located in designated office areas and are therefore to remain offices. When all 62 structural vacant office would be transformed into residential units, using the average size of the most common housing type of the specific neighborhood this office building is located in, then 4.774 residential units could potentially be added to the Rotterdam stock. However, since 24 of these 62 buildings have no transformation potential, the potential residential units from these buildings will be excluded. The 38 remaining office buildings may be transformed into 1.706 residential units. Of the 50.000 needed these 1.700 is only 3.4% of the total needed residential units by 2030.

In essence the Conversion Meter 2017 is a yes and no checklist combined with a first cost-benefit analysis. The set veto and gradual criteria used to assess the buildings come from years of tool development using scientific research. By going through all the steps, it lets the user think about all aspects that need to be considered when initiating a transformation project. The simplicity of the tool, which is the step by step approach from broad to detailed and the required input, is what gives it its strength. The relevance and usability of the research was evaluated and confirmed by experts. Experts selected to evaluate the adapted tool and its results were professional real estate developers specialized in transformation projects. The evaluation gave input the further adapt the Conversion Meter Rotterdam 2018. After this second adaptation of the tool, the entire Rotterdam office vacancy portfolio was put through all the steps again. After this second run only 13 buildings were classified as excellent (2) and high (11) potential. So different types of users weighing criteria differently may give different outcomes. However, the structure, the systematic step by step approach remains the same. This structure together with the used input and the building passports as output were considered to be very useful into assessing transformation potential. The content of each step can easily be altered to the demands of the user as was shown by the expert evaluation of the tool.

Key words:

TRANSFORMATION POTENTIAL -TOOL / QUICK SCAN / FEASIBILITY STUDY - INFLUENCING - FACTORS - VETO CRITERIA & GRADUAL CRITERIA - PUBLICLY AVAILABLE DATA / DESK RESEARCH – ROTTERDAM - STRUCTURAL VACANCT OFFICE SPACE - HOUSING / RESIDENTIAL

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1. Research design

This first chapter lays down the research design, in which the problem description, problem statement, the research questions, the intended end result and, the methodology are discussed.

1.1 Problem description

In the Netherlands many buildings are empty or have lost their function, among those are office buildings, schools, industrial sites, barracks, and other utility buildings. The highest vacancy rates, however, are recorded in the office market (Cushman & Wakefield, 2017). On January 1st, 2017 there was 7.669.416m^2 of vacant office space or 15,9% recorded (PBL, 2017). This oversupply is caused by among other things a drop in demand due to economic shifts and new ways of working (Buitelaar, 2017). Within the Dutch office market there are regional differences noticeable. In the Randstad, a region where all major cities are located, is where most office vacancy is recorded. Of all major cities, the city of Rotterdam is coping with the highest vacancy rates. In this city 18,7% of its total office stock was recorded as vacant on January 1st, 2017 (PBL, 2017).

Not all vacancy is considered to be a problem. Within the real estate literature, a distinction is made between initial and friction vacancy (vacancy less than one year), long-term vacancy (vacancy between one and three years) and structural vacancy (vacancy more than three years) (Buitelaar et. al, 2013). For the office market to function optimally about 4 to 6% should remain frictionally vacant (Zuidema, 2010). Of these three categories in office vacancy, structural vacancy has increased considerably in recent years to 65% on January 1st, 2017. This is a problematic development. Structural vacancy is problematic because these objects will not be taken up by a rising economy (Remoy, 2014). In other words, without some sort of intervention these buildings will remain vacant with all its associated financial and social consequences.

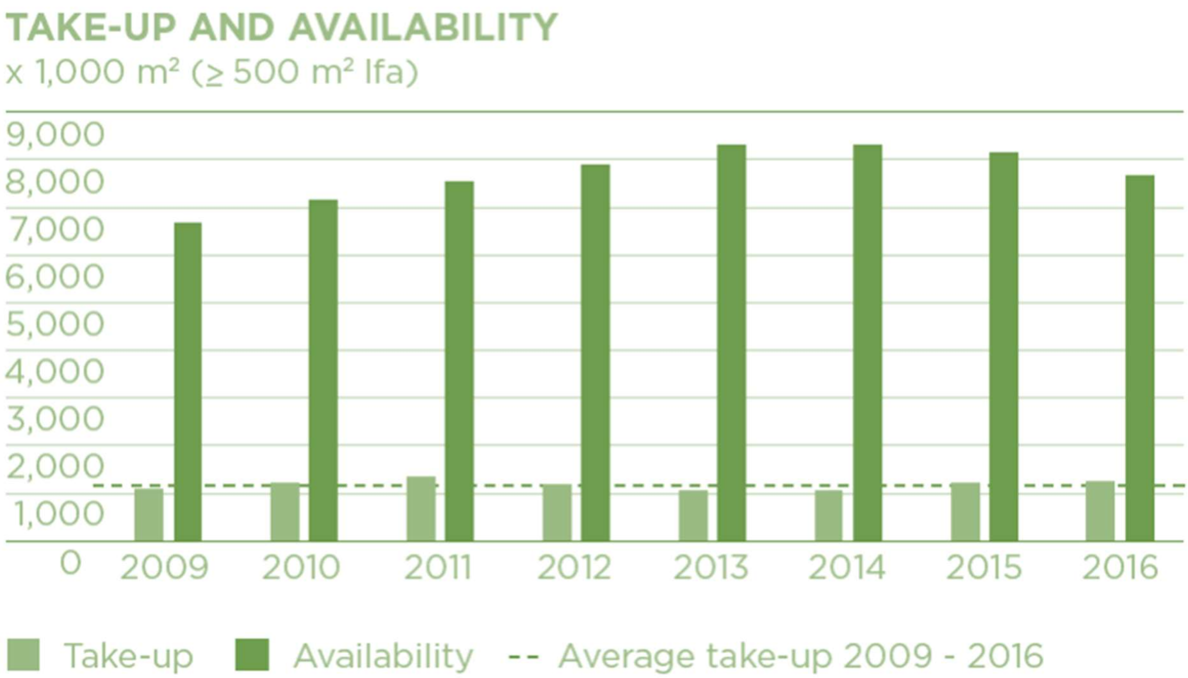


Figure 1, Office take up and availability in the Netherlands (Source: Cushman & Wakefield, 2016)

There are several intervention strategies to cope with office vacancy. The options are selling, consolidation, renovation, demolition and build new, or transformation. However, by just selling the object the problem is not solved. The same goes for consolidation, as mentioned before, waiting for a rising economy will not be a solution. By renovating the building, the quality is improved of the original office function, however this function is most likely no longer desired on its location since it is structurally vacant. Function change is the most viable solution and can be obtained by either demolition and new build or transformation. Since 2012, more office space has been withdrawn from the stock than being added. In recent years the number of withdrawals has increased and surpassed the number of additions (Buitelaar, 2017). In 2016, this take up of office space has finally resulted in an overall decline of office vacancy (Figure 1). The question is whether this decline is enough to reduce office vacancy in the longer term to its healthy levels of 4 to 6%. After all the overall demand of office space is also going down.

This mismatch of demand and supply is not just an issue within the Dutch office market but also for the housing market. The difference between the two markets however is that the office market is coping with an oversupply and the housing market with a shortage, especially in the Randstad area where space is scarce. This increasing demand is caused by the migration to the cities, households becoming smaller, and insufficient building production in recent years (NOS, 2017). These signs of an overheating housing market are also showing in the city of Rotterdam which is also located within the Randstad. Here prices have risen significantly and, on some locations in the city, have already surpassed those of before the economic crisis in 2008 (NVM, 2018).

1.2 Problem analysis

A possible solution for both the office and housing market could be through transformation. By transforming the redundant structural vacant office space into new residential units, office supply decreases, and housing supply will increase. Essentially aligning both markets with a single solution. Transformation into another function is the more sustainable way to cope with structural office vacancy compared to demolition and new build. This strategy is not a new phenomenon. In the 2015 and 2016 there was 927.000m^2 and 963.250m^2 respectively of office space transformed. In 2017 the transformation volume comprised of approximately 565.000m^2. This is a decrease of no less than 41% compared to the previous year and is the lowest volume since 2013 (Dynamis, 2018). The new function of these transformation projects is mainly residential. In 2015, 76% of the total volume was reallocated to living space. Due to the increase in demand for housing in 2016 the share of transformations with a residential destination increased to 92%. In 2017 however, despite the increasing pressure from the housing market, only 66% of the transformation volume was transformed to a residential function, which can be related to the location and other influencing factors.

For transformation projects to be successful, a number of factors are important. These include among others, a tight market of the future function, for example housing, locational factors and building characteristics. Experts say that around 50% of vacant office space is suitable for transformation (Remøy, 2014). The reason not all structural vacant office buildings are suitable for transformation is because some or all of the prerequisites for a successful, in other words, feasible transformation are not present. Some say that the “low hanging fruit” has been picked and only vacant buildings with low to none transformation potential are left in the Randstad (Dynamis, 2018). While others say the vacant office space in Rotterdam is located on high transformation potential locations (PropertyNL, 2017). Therefore, better insight is needed in the true transformation potential of each structural vacant office building in Rotterdam. To give insight into the transformation possibilities of structural vacant office buildings, various tools have been developed aiming to incorporate these influencing factors in order to assess a buildings’ transformation potential. These tools should be reassessed and tested to uncover Rotterdam’s true transformation potential. With this insight, more much needed transformations projects may be initiated to reduce office vacancy and increase housing supply.

1.3 Problem statement

It is said that the amount of vacant office space suitable for transformation towards housing is declining. However, exact data on how much potential transformation volume is left and what its transformation potential is, is unknown. Furthermore, structural vacancy is increasing. At first sight the situation in Rotterdam may offer possibilities for expanding the transformation market of office space into housing, due to its high office vacancy rates, the location of its structural vacant office space, and its tight housing market. To test this transformation potential of Rotterdam's structural vacant office space with an improved assessment tool which combines among others the aforementioned influencing factors the following main question is posed:

> **In what way and to what extent can current transformation tools measure Rotterdam's transformation potential of structural vacant office space towards housing?**

In order to operationalize the main question, the following sub questions are formulated:

> *What existing tools are available and can be used to measure transformation potential?*
>
> *What factors affect the transformation potential of Rotterdam's structural vacant office space into housing and how are these incorporated in existing tools?*
>
> *What is the percentage of structural vacant office space that potentially can be successfully transformed in the city of Rotterdam?*
>
> *How many residential units can be added to the Rotterdam housing stock with transforming its vacant office space?*

1.4 Methodology

Chapter 3 elaborates further on the proposed methodology here.

Literature review

The first part of the research consists of a literature review. This literature review is used to set up a theoretical framework. This framework forms the foundation of the new transformation potential measuring tool. In a literature review, as much relevant knowledge as possible about the subject is gathered from existing literature, articles, and other publications related to the topic. This literature review will form the foundation of the new transformation potential measuring tool. Background information and more in depth analyses of office vacancy, tight housing market, given zoomed in from the Dutch national market to the local Rotterdam market. Then the intervention method transformation is researched. Influencing factors related to successful transformation projects will be extracted from this information and will be categorized according to market, location, and building. Lastly, tool that incorporate these factors will be researched. Findings of this literature review will form the foundation of the second part of this research, the empirical studies.

Empirical study

Input from the literature review will be the starting point for the empirical study. With this information an adapted version of the Transformation Meter tool will be constructed. In order to test this adapted version and to measure Rotterdam's transformation potential the tool will be tested on all structural vacant office buildings in Rotterdam. Before the testing can commence, the population has to be selected. The population i.e. the input to testing the tool are physical artefacts which in turn are all structural vacant office buildings located within the municipality of Rotterdam. Information on these office buildings is gathered through desk research using various data sources (Funda, BAK), ranging from market information from local realtors to location and building characteristics via Google Maps.

From these sources I will collect all data per office building starting with address, size, age, and most importantly vacancy duration. From this last criterion I can determine if the building is structurally (3 years or more) vacant or not. Only these buildings will proceed to step 1 of the adapted Transformation Meter.

The selected population (all structural vacant office buildings in Rotterdam) proceed to the first step of the adapted Transformation Meter. These case studies are run through the meter. The output of this case study analysis is the uncovered true transformation potential of Rotterdam. This will be visualized using a GIS-Map. These results are then evaluated by an expert panel. Figure 1 is a schematically depiction of this research's methodology.

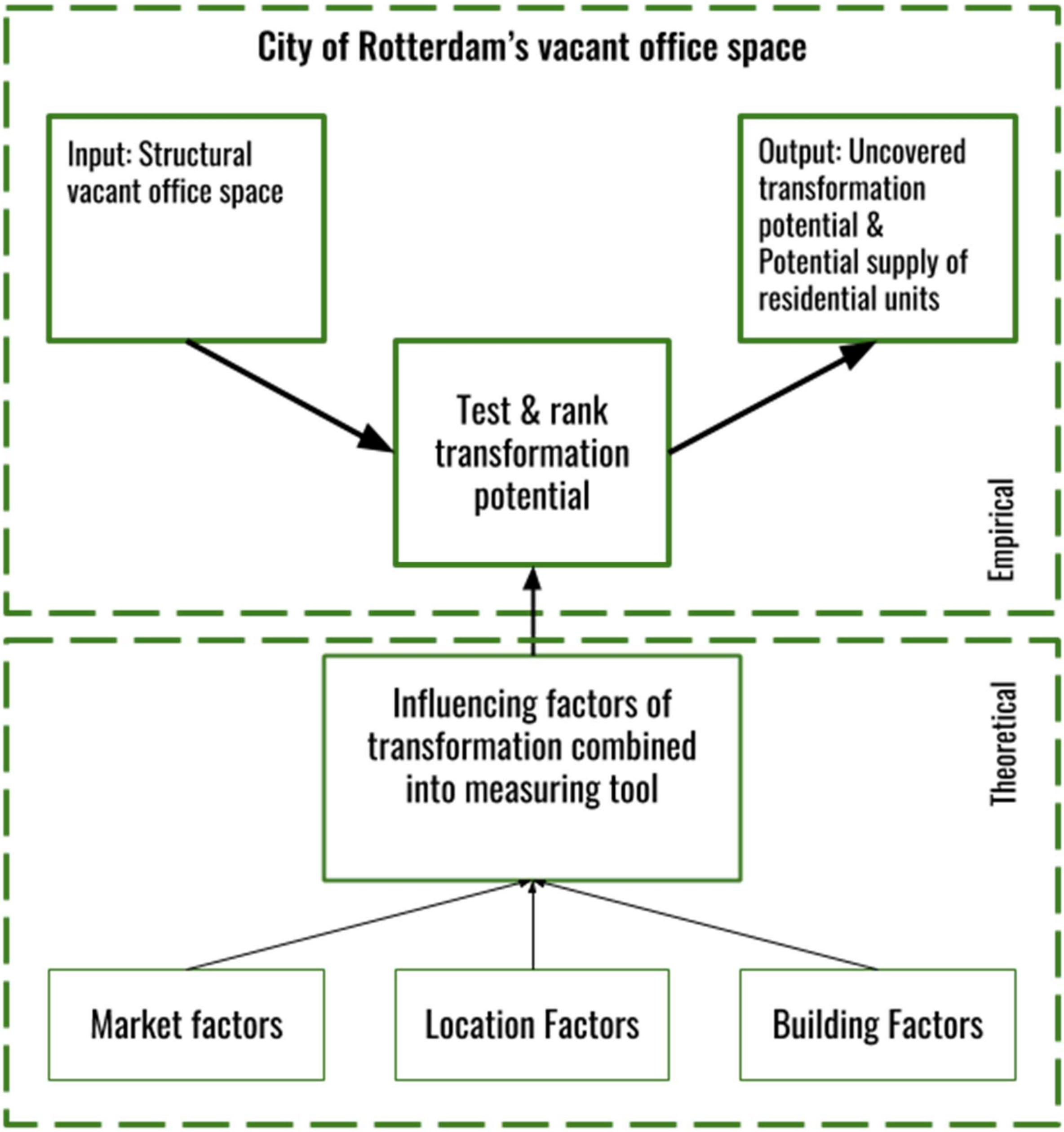


Figure 2, Conceptual model research design

1.5 Scope

This thesis is about uncovering the transformation potential of Rotterdam's vacant office space into housing by developing a transformation potential measuring tool incorporating all relevant factors of a transformation project. This research focusses only on the transformation potential of structural vacant office buildings to housing in Rotterdam. However, the tool may be suitable for use on other area's coping with structural office vacancy.

1.6 Research aim

The aim of this research is to uncover all affecting factors related to transformation projects, combining these factors in a transformation potential measuring tool, and running this tool on all structural vacant office buildings in Rotterdam. With this insight, more much needed transformations projects may be initiated. Which in turn this can ultimately reduce office vacancy and increase housing supply in the city of Rotterdam.

social relevance

Vacant real estate affects its immediate environment. This influence can express itself in various ways. Vacancy can affect the value of the object itself and on the value of surrounding buildings. In addition, vacant buildings have an influence on the social nature of the environment, often occupying valuable space within the built environment and causing the loss of income for owners. Transforming the vacant building not only reduces the environmental impact by reducing the amount of waste produced but also keeps the cultural heritage intact.

scientific relevance

Buildings, just like cities, change through new developments and technology. Buildings, infrastructure, and public areas become outdated technically and economically, but also due to spatial shifts and changes in function and in cultural values. Available space becomes increasingly scarce, the need for more surface is growing and therefore vacant buildings under increasing pressure to be addressed in the most sustainable way i.e. adaptive reuse. This research follows up on previous research about measuring and modelling transformation potential (Remøy 2010, 2014, 2017; Geraerdts, 2017; Van der Voordt, 2017; Muller, 2008; Rodermond & Van Gool, 2011; Djajadiningrat, 2013; PBL, 2017; Brink, 2017).

2. Literature review

2.1 Introduction

The literature review serves two purposes. First, to give more background knowledge on the described problem from chapter one. Secondly, to be used as starting point for the empirical part of this research. This chapter therefore starts with a in depth description and analysis of the office oversupply and housing shortage in the Netherlands, and how transformation may serve as a possible solution to both problems. Then Rotterdam is analyzed. The city in the Netherlands with the highest office vacancy rates but supposedly high transformation potential. This chapter ends with an analysis of three transformation tools, which may be used to measure Rotterdam's transformation potential.

2.2 Office vacancy

A lot has been said about office vacancy in the Netherlands. The thing everyone agrees on is that the oversupply of office space that no longer fulfills the current users' requirements (JLL, 2015). The high vacancy rates in the Netherlands are causing various problems. Too much vacancy can lead to area degradability, poor investment imagery and loss of value. On January 1st, 2017 there was 7.669.416m^2 of vacant office space or 15,9% recorded (PBL, 2017). Looking at the global office space markets it is obvious that the Dutch office market has a problem that needs to be addressed (Figure 2).

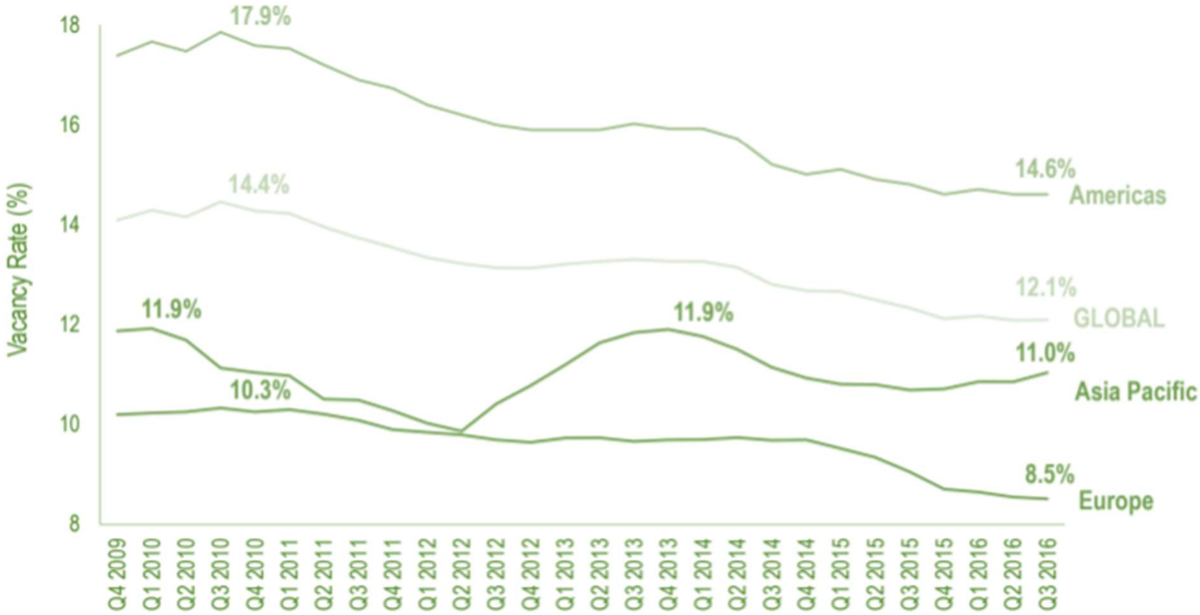


Figure 3, Global and regional office vacancy rates 2009 - 2016 (Source: JLL, 2016)

There is however a positive change noticeable. At the end of 2015 a vacancy rate of 17.1% was recorded in the Netherlands which accumulates to approximately 8.47 million m^2 of vacant office space (NVM, 2017). Not only did total supply drop, but also the number of offices that have been available for a long time went down in 2016 from 4.4 to 4.2 million m². Supply levels dropped as a result of intensified demand but mainly because quite a significant number of buildings have been withdrawn from the stock (approx. 1.08 million m²). 224,000 m^2 where demolished and the remainder was transformed. 76% of this transformed volume were office to residential transformations. Especially in the Randstad area, an area where an alarming lack of homes for rent and sale persisted last year, more residential space was provided in former office buildings (NVM, 2017). However, as shown in figure 4 there is still a significant mismatch between demand and supply, which must be dealt with. However, the aim should not be to completely diminish vacancy. For the real estate market to function optimally only 4 to 6% of the total stock should remain vacant (Zuidema & Van Elp, 2010). Meaning that in the Netherlands approximately 11% of office space is unnecessarily vacant and should be dealt with.

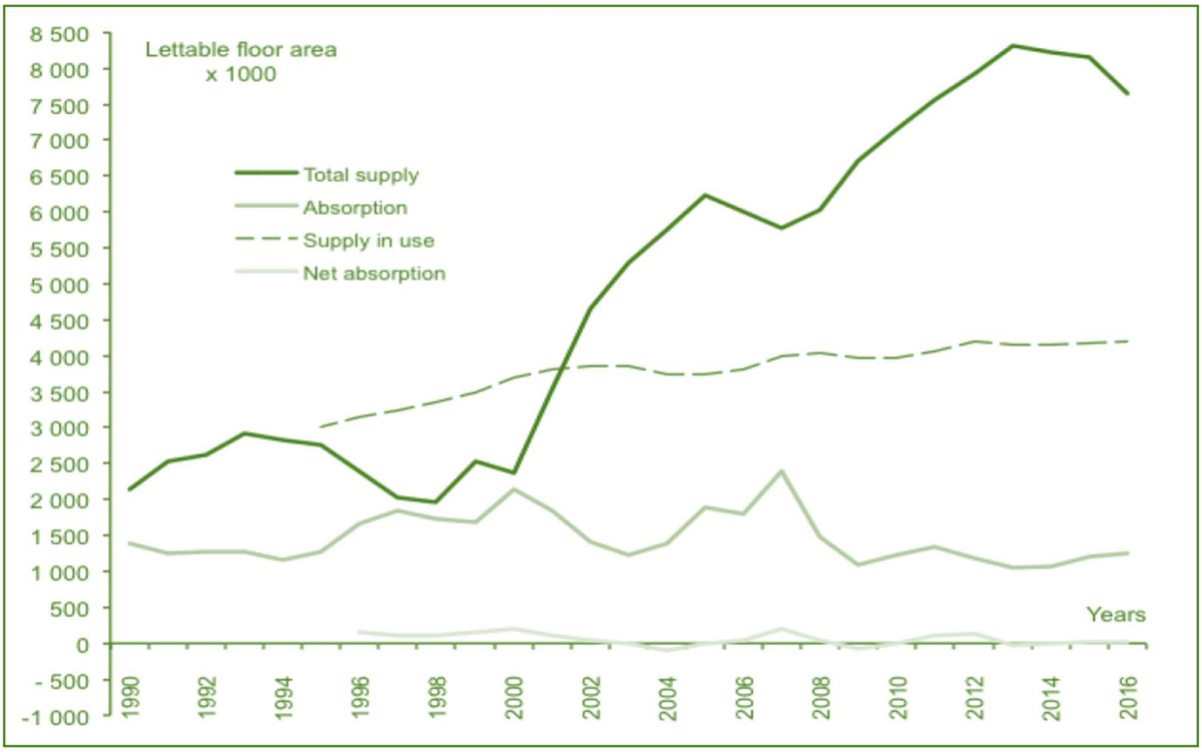


Figure 4, Vacancy levels in the Netherlands, 1995-2016 (Source: Geraedts, R.P., D.J.M. van der Voordt and H. Remøy, 2017)

The Dutch economy grew in the 1980s, 90s and the century ended with a peak recording growth rates of over 4 percent (JLL, 2015). This growth resulted in more employment, especially office jobs increased significantly. Consequently, a rising demand for office space resulted in many new offices being developed, and the office stock grew. Growth continued until the IT-hausse (boom) period. Economic growth, together with the rise of the IT sector, caused a great demand for office space. With prospected growth in mind, IT companies often rented twice as much office space than necessary. Then, with the bursting of the IT bubble in 2000, this office space was not utilized. Therefore, the ratio between supply and demand ranged considerably, i.e. an expansion of the office market. Here the first signals were visible of the oversupply on the Dutch office market we see today, as shown in figure 5.

The vacancy rate shows an especially strong increase around the turn of the century. The bulk delivery of new construction projects was the main reason for this increase. After a period of scarcity and reluctance from municipalities, investors and developers started to take on new developments on a large scale towards the end of the 1990s. These new office projects where being developed 'at own risk'. Meaning that up to 80% of the new offices were developed without having a user in place beforehand (Zuidema & Van Elp, 2010). The delivery of these new developments was almost entirely responsible for the increase in vacancy rates up until 2002. Only after 2002 does the number of new offices decrease again. However, the vacancy rates in the existing stock increased significantly. Office organizations moved to these new buildings leaving their old office space behind, adding to the vacancy. As a result, the share of vacancy in new construction decreased, but did not fall below 10%. Partly, because (although limited), at that time there were still offices being built at own risk and simply no users were found for all recently delivered office buildings. This oversupply of new buildings is typical for the real estate market and known in economics as boom and bust cycles (Dutch: "Varkenscyclus").

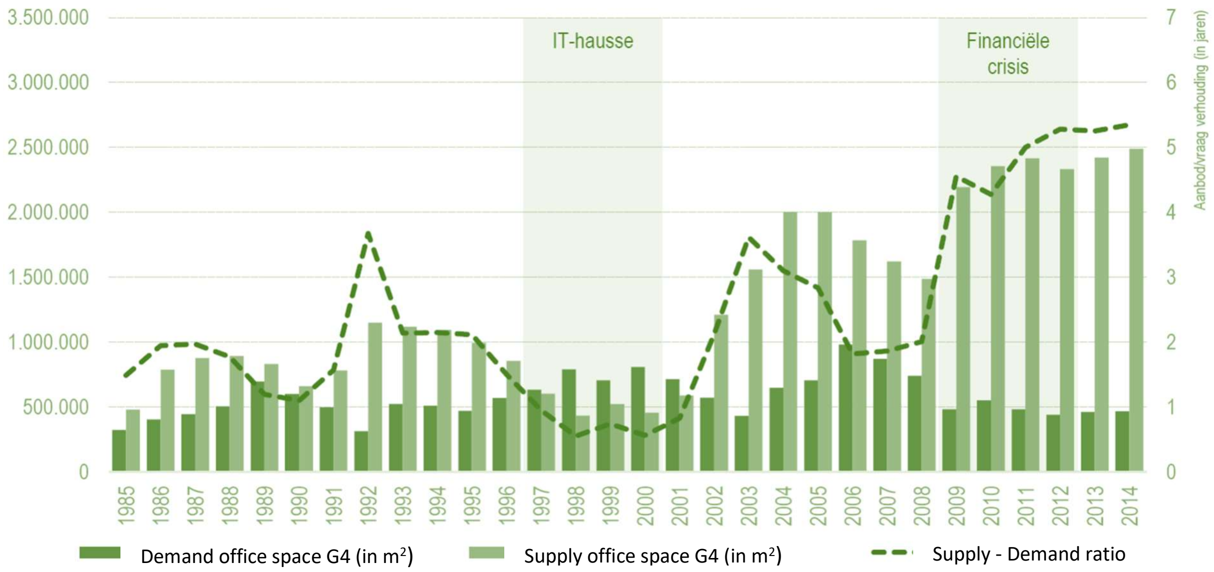


Figure 5, Historic development of office space supply & demand in sqm per annum (Source JLL, 2015)

The opacity i.e. lack of transparency of the market, combined with the cyclical sensitivity of demand for offices and the long construction phase, led to observation of a clear cycle in the office market. In this boom and bust cycle periods of major scarcity and excess supply alternate each other. The demand for office space is driven by employment development, which in turn is driven by demographics and in particular by economic growth. In times of prosperity the rent prices rise and in response to this rise, development of new office space starts. In the case of a boom and bust cycle this amount of new developments is too high, resulting in an oversupply. The cycle is strengthened by the fact that the office market is a stockpile market, has a delay in supply (which is often only known after the limits of the existing stock is reached) and, offices have a long production time. Developers mostly build in an upward cycle, in part, speculatively (at own risk), and that means that for the developed offices at the start of construction, no tenant is found yet. This speculative new office space is then delivered too late and is too big for the then current market where the business cycle is already reversed. In the first years after the turn of the century, economic growth has decreased, due to events such as the 9/11 terrorist attacks in the United States and the bursting of the IT bubble played a major role. In 2003 the Dutch economy recovered slowly and in 2006 and 2007 grew again by more than 3 percent (JLL, 2015). During this period demand for office space increased.

The surplus declined slowly and resulted in a less extreme mismatch between supply and demand. However, this recovering relationship between supply and demand in the office market was short-lived. Due to the financial crisis in 2008 demand for office space dropped again. Banks and insurance companies were mostly affected and heavily influenced office employment. The following years, the Dutch economy remained unstable and saw companies' turnover recede, resulting in many redundancies at large employers. To reduce expenses, cost-cutting measures were taken in several ways, including in their real estate. Emerging trends, such as automation and new ways of working, were accelerated. Through these trends, companies facilitated the same number of employees on less square meters of office space. The average 2 million m² demand in the period just before the financial crisis fell to just over 1 million m² in the years 2012 - 2014. At the same time, the supply of 4.7 million m² in 2007 increased to more than 7.1 million m² in 2010 and remained the same since then, hence the mismatch between supply and demand grew further apart (Zuidema, 2010). Even though the Dutch economy is now growing again, no increase in office-related employment is expected. The further automation of businesses is expected to continue to lower the demand for office space in the future. This means that vacancy levels may start to increase again if the amount of take up decreases.

In addition to this quantitative development, the demand of today's office user has also changed qualitatively. The location and quality of office property plays an important part here. The dynamics that still exist are mainly located in major cities within locations that are well-connected to public transport and urban networks. Furthermore, the quality requirements of office users have been tightened and sustainability is high on the agenda. Having a more sustainable building is pushed forward through new legislation. The new law requires office buildings to have a minimum energy performance label C in 2023 (Rijksoverheid, 2017). If this mandatory performance label is not met, the office building may not be used. The Dutch national government also gave notice that the energy performance label of in use office buildings must have label A in 2030. The obligation for a label C therefore amounts to 52% of the current stock. Respectively 66% and 75% of office space becomes affected by mandatory labeling B and A (EIB, 2017). In short, demand and supply in the office market shows a strong polarization in both quantitative and qualitative terms, which means that a large part of the current office (over) supply is unlikely to get a new tenant / user. Which in turn this vacancy will become structural. Within the real estate literature a distinction is made between initial and friction vacancy (vacancy less than one year), long-term vacancy (vacancy between one and three years) and structural vacancy (vacancy more than three years). The latter category has increased considerably in recent years, in contrast to total vacancy.

The aforementioned events over the past decades have changed the Dutch office market from an expansion market to a replacement market. In this replacement market, vacancy will not be quickly eliminated because the take up will be mainly at the top of the market where the structural vacancy is relatively low, with the result that the bottom end of the market will remain vacant. Hence, forecasts indicate that demand will fall in the future, due to economic, technical, and demographic changes adding to the vacancy. As the years pass by the buildings become older and less attractive. Rental contracts end, and tenants move to newer high-quality locations leaving their old buildings behind. Slowly but surely the older office buildings are getting less attractive to move towards. Owners try to keep tenants on, by offering incentives. However, the buildings will eventually become completely vacant. Over time this frictional vacancy becomes structural vacancy after a period of three years. It is forecasted that of the total vacant stock 60 to 70% will not be used again, and will become structurally vacant (Zuidema & Van Erp, 2010). Indicating that these buildings are completely redundant as office space as illustrated below in figure 6.

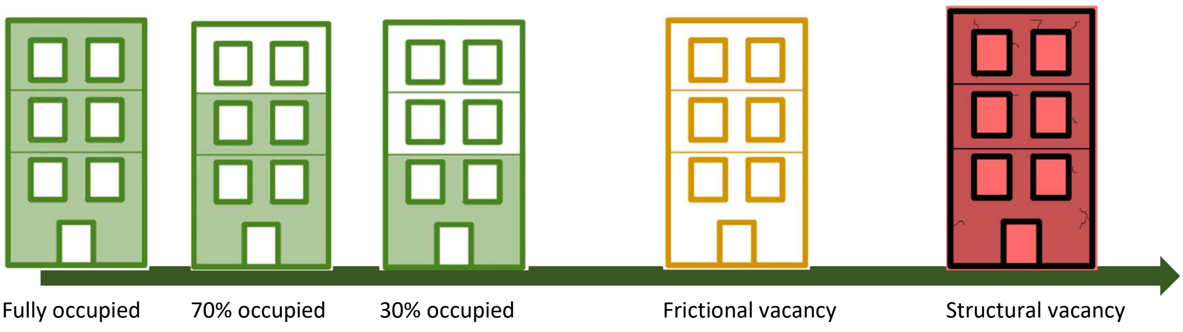


Figure 6, illustration of increasing vacancy due to replacement market (Source: Own Illustration)

Sixty five percent of office vacancies are recorded as structural (PBL, 2017). As previously mentioned the Dutch office market showed a noticeable drop in its oversupply in recent years, which seems to have ended the increase in the total vacancy. However, structural vacancy is still increasing, as shown in figure 7. This type of vacancy will not be taken up by a rising economy (Remøy, 2014). These objects should therefore be withdrawn from the stock either through demolition or transformation. In other words, these office buildings have reached the end of their life cycle.

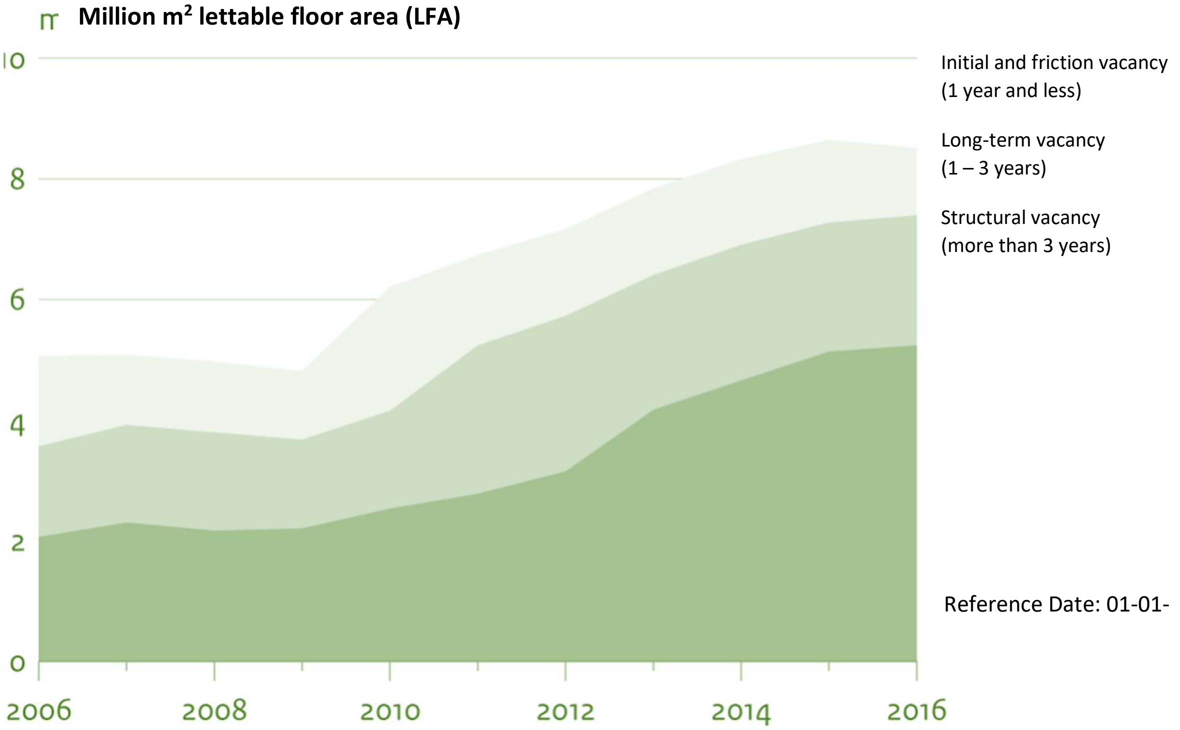


Figure 7, Duration of office vacancy in years in the Netherlands (Source: PBL, 2017)

How a building becomes obsolete has to do with its life cycles or life spans. The life cycle of a building can be divided into three types:

1. *Technical lifespan;* The technical life span is the period that the building remains as is after realization. This depends on the use of materials and equipment. The technical lifespan of one building is generally longer than the functional and economic life. A building asks for technical adjustments only when used materials are worn. Sustainable materials thus increase the technical lifespan of a building.
2. *Functional lifespan*; The functional lifespan is the period that the building meets the requirements to accommodate the function for which it has been developed for. The functional lifespan is very dependent on external developments affecting the building users' needs. Rapid developments ensure a short functional longevity, making new investment scenarios necessary. Building flexibility increases the possibility of realizing functional changes, flexibility is therefore important in functions with rapid developments.
3. *Economic lifespan*; The economic lifespan is the duration of the period that the net present value of the future returns is higher than the net present value of the future required expenses. The economic lifespan ends when the net present value of the objects' exploitation proceeds is lower the net present value of the lands' proceeds after demolition of the building.

When a building has reached its acceptance limits of its functional, economic, and / or technical lifespan the building owner will have to choose between different accommodation strategies. These involve function renewal, function change or function termination. For a building owner to align its real estate to one of three aforementioned strategies he/she has the following intervention methods to choose from:

Intervention Method	Advantage	Disadvantage	Function Change
Do nothing	• No extra expenses on short term • Minimizing running costs	• Vulnerable to vandalism • Depreciation • No revenue	No
Maintain in current state	• Preservation of real estate • Preservation of current use • Future possibilities are left open	• Maintenance costs rise • Current problems are not properly solved • Maintenance costs and obligations continue	No
Renovation	• Extend life span • Postpone impoverishment • Reduce building redundancy chance • Limited revenue	• Replacement of certain parts can be costly • Extended life span is shorter than building new	No
Transformation short term	• Generate revenue • Social security direct area • Flexibility in use and management	• Building image can be damaged • Only temporary • High costs	Yes
Transformation long term	• Changes according to new function/user • Sustainability (reuse of current structure) • Preservation of building identity	• Time consuming intervention • Costly on short term	Yes
Demolition & New Build	• Changes according to new use • Building no limitation to perform new function	• Longer development period • Costly • High environmental impact • Loss of capital	Yes

Table 1, Intervention methods

In addition, it can be decided to sell the building, but the new owner will be faced with the same accommodation/intervention strategy decision.

2.3 Office to housing transformation

Part of the vacancy problem can be solved in a sustainable way through transformation. Adaptive reuse of buildings is nothing new and has been done since the existence of buildings. Transformation of real estate is the change of use of offices, shops, or business premises to another function, usually residential. The changing of (structurally) vacant office buildings or buildings with a social function (education, care) transformed into living space or another function resulting in an improvement. This improvement lies in various social advantages. Primarily, vacancy is being combated and new supply of another demanded function is being created. An empty office can eventually have a negative effect on the living environment; deterioration, vandalism, and feelings of insecurity around the building are lurking. When vacant offices get a function or a mix of functions, for example living, business and catering, this can improve the quality of life in the area. Moreover, with permanent transformation, savings can be made on the construction time and construction costs compared to new construction because the structure is already present (Remøy, 2014). Which is good from a sustainability point of view. If it concerns an appealing building, in terms of architecture or cultural-historical value, this can also offer added value for residents.

In recent years a large amount of office space has been withdrawn from the stock through transformation to a new destination. In 2015 and 2015 the transformation market peaked and up to 927,000m^2 and 963,250m^2 respectively was withdrawn. In 2017 these high volumes were not met, but a significant drop in transformation projects was recorded. The transformation volume in 2017 was approximately 565,000 m2, a decrease of no less than 41% compared to 2016. This is the lowest recorded transformation volume since 2013. This strong decline is mainly caused due to less transformation projects being done in the Randstad. Here the volume has been more than halved. The transformed volume outside of the Randstad was similar as in 2016, approximately 200,750 m2 (Dynamis, 2018).

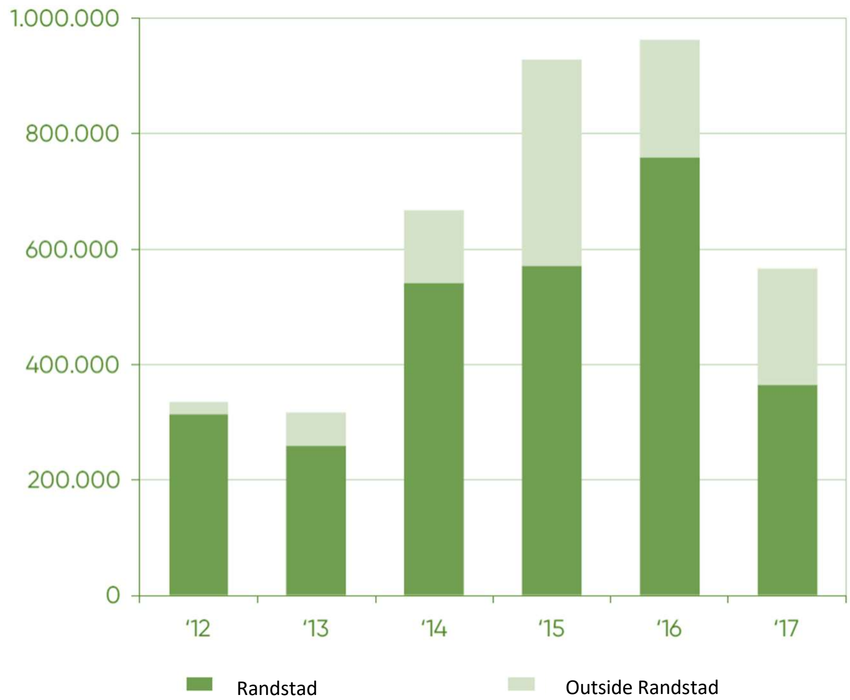


Figure 8, Transformation volume in the Netherlands in m^2 (Dynamis, 2018)

A clear shift is visible in the new destination the transformation volume of the withdrawn office space. In 2015, 76% of it was transformed into housing. Due to the increased in demand for housing in 2016, the share of transformations with a residential destination increased to 92%. Despite the increasing pressure from the housing market in 2017, only 66% of the transformation volume acquired a residential destination last year (Dynamis, 2018). The cause of this drop in residential transformations should not be sought in its demand but may be related to the characteristics of the available buildings. The vacant offices at suitable residential locations have often been transformed, as a result of which fewer buildings lend themselves to a residential function (PropertyNL, 2018). The share of transformations for hotels or multifunctional destinations has actually increased (CBS, 2018).

In addition to decreasing the number of transformations with a residential destination, is there is also a shift visible in the construction years of the transformation objects. Previously, offices constructed between 1960 and 1990 were considered suitable for transformation. Nowadays all buildings from the 90s and even buildings constructed after 2000 are being transformed (Dynamis, 2018). This is a result of older buildings suitable for transformation are simply running out. Therefore, more recently built buildings are being transformed. This trend is clearly reflected in the median year of construction of the transformed offices. In 2014, the median year of construction was 1975, since then, this has increased to 1980. This trend is particularly evident in the Randstad. Here the median year of construction has increased in the last four years 1972 to 1988. In 2017, half of the transformation projects in the Randstad were younger than 29 years (CBS, 2018). This trend is however less visible outside of the Randstad. The later rise of the transformation market may be the explanation of this. Now also in these areas an increasing proportion of the relatively old office buildings are being transformed. It is only a matter of time before the median of the year of construction of the transformation objects rises.

Transformation playing field

It is said that the amount of vacant office space suitable for transformation towards housing is declining. However, exact data on how much potential transformation volume is left and what its transformation potential is, is unknown. As described above there are certain factors that determine if a building is suitable for transformation. I have identified a transformation playing field containing prerequisites and boundaries. There are four prerequisites determine the transformability of an office building: a tight housing market, the location of the redundant office building, certain technical building characteristics, and sustainability aims. These four prerequisites are bound by three interrelated influencing boundaries. These are technical, legal, and financial boundaries. The playing field is visualized below in figure 12.

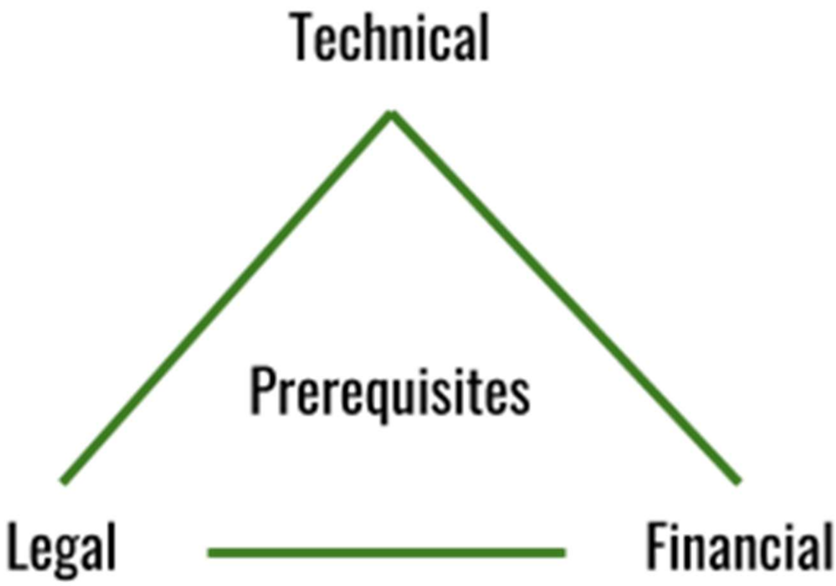


Figure 9, Visualization of transformation playing field. The relation between transformation prerequisites and boundaries

Prerequisites to successful transformation

Tight housing market

The first prerequisite of successful transformation is the presence of a tight market of the future function. The reason more background information and an in depth analysis on the overall Dutch and local Rotterdam housing markets is described, is because of Rotterdam's ambition of realizing mostly housing in its vacant office space.

When we speak about the housing market, we are talking about all trade, buy, sell, and rent, within stock of Dutch homes. It is not therefore not to be confused with the number of houses in the Netherlands, this is the housing stock. The total Dutch housing stock consists of over 7.6 million units. The majority, 4.3 million, of which is owner occupied. 3.2 million units are rental homes which can be divided into two groups. Social housing corporations which hold 2.2 million units and the remaining 1 million are rented out by other companies, individuals, or institutional investors such as pension funds and insurance companies. For the remaining 100.000 units it is unknown who the owner is and if it is for the owner occupied or rental market (NVM, 2017).

The Dutch housing market is an important factor for the Dutch economy. Housing transactions influence the growth (or shrinkage) of the Dutch economy. The housing market in the Netherlands, according to the NVM, cannot be defined as a singular market. It can be divided into three regional levels. The first level is located in the Randstad together with the cities Eindhoven and Groningen. This regional market "overheating" due to the limited supply and high demand. Prices here are already 10% higher than the highest point just before the 2008 credit crunch (NVM, 2017). The other two regional levels are considered more balanced markets. These are the larger cities such as Arnhem and Breda and the more rural areas in for example East-Groningen and North-Limburg. This research will therefor leave the latter two areas out of consideration.

To understand the current overheating of the housing market we must go back to 2008, just before the financial crisis hit. In August of 2008 the Dutch housing market peaked. Back then the average price of a house in the Netherlands was 261.900 Euro. With a mortgage rate of 5.3% people used to pay more for their house then nowadays. However, shortly after this peak the market collapsed due to the financial crisis as mentioned before. The average price of a home dropped to 206.100 Euro. From this low point in 2013 the housing market has been recovering ever since, reaching a new peak in the third quarter of 2017. The average selling price reached a record high of 264,000 Euro. Also, the number of days a house is for sale has been decreasing for a while. In the third quarter last year it was 79 days. In the same period this year it was 54 days. The short for sale period is caused by the high demand of city living.

Several factors cause this high demand. The historically low mortgage rate of 1,65% (CBS, 2017). Due to this low mortgage rate buying a house now is particularly attractive. Because you need to pay less interest on your purchase amount, you can spend a higher amount on your home. In short, you get more value for money. Demographics also affect the overheating of the market. In recent years the Dutch population has grown significantly, even more than predicted by the Central Bureau of Statistics. People are becoming older, and even though the birthrate is going down, the number of immigrants is increasing with such a rate that the total population is growing. Especially in the Randstad area due to all the amenities in the close vicinity, adding to its popularity e.g. demand.

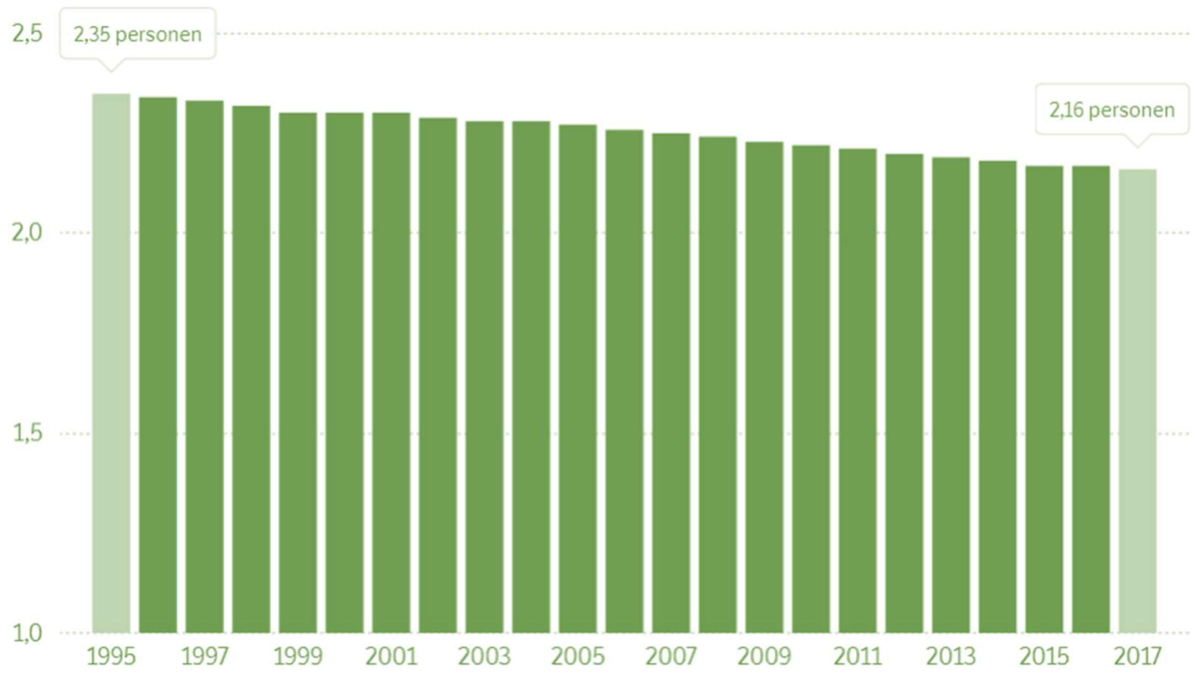


Figure 10, Average household size in the Netherlands (Source: CBS, 2017)

Another factor that needs to be considered is the number of households. The average household size has been decreasing since 1995 (figure 12). Resulting in more households, meaning even more houses are needed. While the number of households kept increasing in recent years, the number of new homes lacked behind. While around 80,000 homes were needed, between 45,000 and 55,000 homes were added figure 13. Therefore, experts say the one true solution is to scale up building production (NOS, 2017). There are 200.000 homes necessary right now and 1 million new homes must be realized in 2040 to keep up with demand (PBL, 2017). However, within the Randstad there are limited building locations due to the fully developed VINEX locations. A significant amount of the much needed new supply to cool down the housing market can be created through transformation of obsolete buildings (Boelhouwer, 2017).

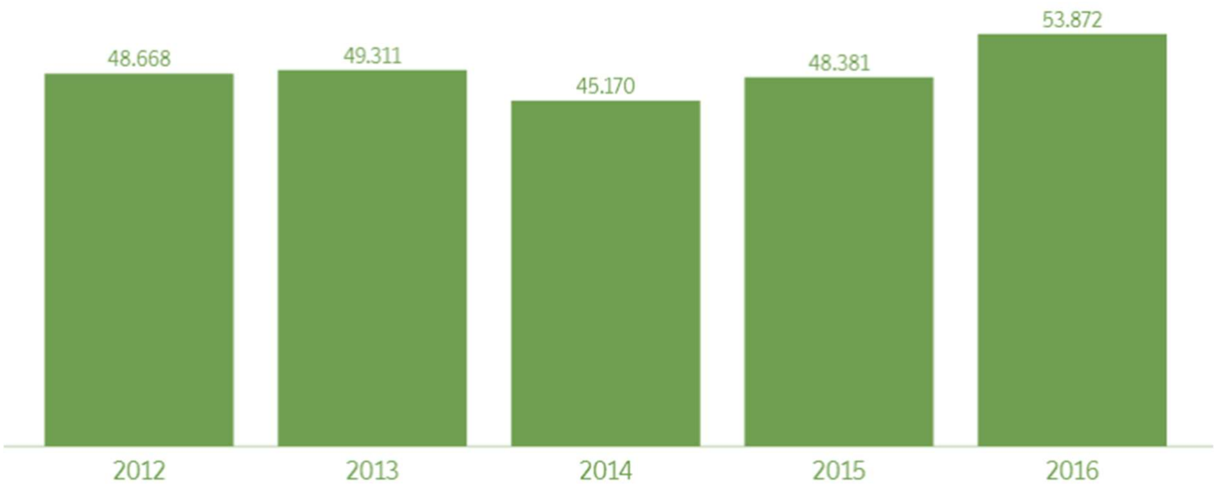


Figure 11, Residential building production in the Netherlands (Source: CBS, 2017)

Location

Probably the most important factor in all of real estate is: the location. This is no different in transformation projects. If the location is not right, the project is most likely unsuccessful. Important characteristics for a good location in transformation projects are locations with great accessibility by car and public transport and have all amenities and facilities in its vicinity. Property transformation rarely happen in locations that do not have these characteristics e.g. peripheral areas (Geraedts, R.P., D.J.M. van der Voordt and H. Remøy, 2017). Structurally vacant buildings that are located in these poorly connected areas, transformation of the entire area is necessary (Avidar et al., 2007, Smit, 2007, Koppels et al., 2011). To summarize, a transformation project with a good location and a bad building can still become a successful project. However, a bad location with a good building will most likely result in a bad project. This shows how important location is in transformation projects and in all real estate projects for that matter.

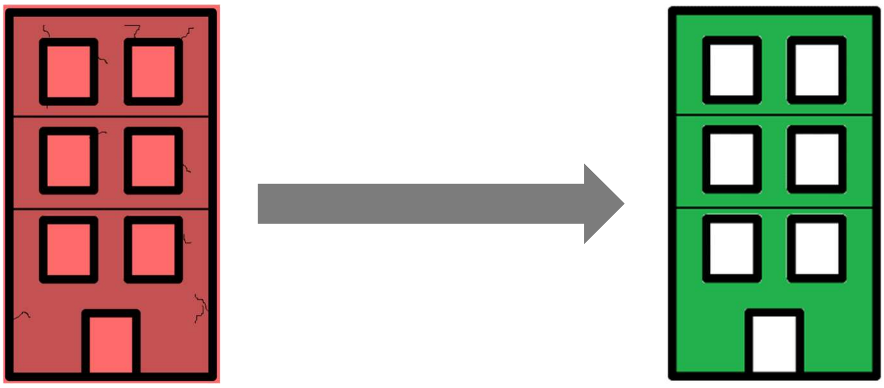
Suitable building

The building itself also affects the feasibility of a transformation project. However, in a lesser extent compared to a tight housing market and location. Approximately half of all office buildings that have been withdrawn through transformation where built between 1970 and 1990 (Dynamis, 2017). This can be related to the fact that many of these offices are located in an attractive location near or in a residential area. Apart from suitable locations, these buildings are also technically well suited for transformation due to certain building characteristics from this period. Characteristics such as floor to ceiling height and distance between columns and load bearing walls. In addition, it has become apparent in the office market in recent years that such buildings hardly have any demand as an office. This is due to the fact that such offices have a limited layout and that these offices often designed in a cell structure layout, so that only after investments there is a possibility for an open plan floorplan, which is in demand nowadays.

Sustainability aims

Sustainability aims are an important driver for transformation. As mentioned before, there are two ways to withdraw an office building. Either by demolishing the object or through transformation. Considering that the built environment account for 40% of the total energy consumption in the European Union, 35% of greenhouse gas emissions, 50% of all materials extracted and 40% of the waste generation (ING, 2017). In case of transformation reusing the existing structure helps reduce minimizing waste. Also, as 80% of the real estate needed for the next 100 years is already built, new accommodation demand primarily should be accommodated in the current stock. Potentially, 50% of the existing real estate can be reused, but still adaptive reuse is not taking place on a large scale (Remøy, 2017). By choosing for transformation (if building is suitable) office vacancy may be greatly reduced in the most sustainable way.

Another factor related to sustainability and offices is the energy label obligation. The Dutch national government intends to make an energy label C compulsory by 2023 for the entire office stock. Part of the stock is excluded and do not have to comply with this sustainability requirement. The exclusions are monuments, buildings in which office (space) is used as a secondary function (<50% user area office function) or buildings that will be demolished, transformed, or expropriated within 2 years. It is estimated that 52% of the office stock has and energy performance label of D or worse. The Economic Institute of the Built Environment (EIB) has calculated that the total costs for upgrading to label C is €946 million to over €1 billion. The costs per square meter is estimated to range from €9,- per m^2 from label D to €57,- from label G. However, the costs for specific buildings can vary considerably. This depends on the structural state and the (im)possibilities for the implementation of measures in a specific building. The obligation is an important step to reduce energy consumption in the office stock and to meet the targets set in the Paris agreement. With the increasing number of structural vacant office space with more often than not with an energy performance label of D or worse the upcoming threshold of Label C in 2023 and Label A in 2030 for office space to be allowed to be in use can be considered as a driver for these building owners to initiate an intervention method.



Structural vacancy   Transformed to residential

Figure 12, illustration of structurally vacant office transformed to residential building

Interrelated boundaries of transformation projects

The four aforementioned prerequires are bound by three interconnected influencing factors that determines a transformation projects' success or failure. These are technical, legal, and financial boundaries.

Technical

Technical factors are related to the buildings' properties. These factors can be divided into two groups: technical properties and functional properties. The first group are the technical properties. With this we mean the materials that have been used, year of construction, energy label, etc. The second group, functional properties, are more related to the use of space. With this we mean the layout of the floorspace, placement of columns and load bearing walls, floor to ceiling height, number of floors, and floor area. The functional adaptability of vacant buildings is of critical importance to conversion feasibility. This depends among other things on the measurements of the buildings' structural grid (Geraedts & Van der Voordt, 2007). For instance, post-war office buildings were "tailored" to fit closely around the function they were meant to accommodate. This tight fit threatens the functional feasibility of conversion into housing.

Legal

The legal boundaries are subdivided into the construction and spatial planning. The Building Decree, the municipal building regulation and the municipal welfare policy belongs to the construction part and the current zoning plans to the spatial planning part.

Zoning Plan; In the municipal zoning plan the city or area is divided into various types of land use. The zoning plan, at the very minimum, prescribes the type of function that is allowed in that area and its height.

Environmental Permit; This permit is required before any large scale construction can commence. The environmental permit is a bundled for all kinds of works in the built environment, ranging from tree felling to placing a dormer window. This permit is tested against the Zoning Plan and Building Decree. Another part of the Environmental permit are the aesthetics and architectural value of the building. Each municipality has their own committee that evaluates each design for its architectural value. A high architectural or cultural-historical value and being marked as a monument will hinder demolition and stimulate adaptive reuse (Benraad & Remøy, 2007). Most office buildings are not listed though, as many are relatively new and not known for their interesting architecture (Remøy et al., 2009). In these cases, the main driver for conversion is not to protect the current building but to get it reused, in order to contribute to the quality of the environment and the future value of the location and the building itself. Requirements to keep and preserve a national or municipal monument can hinder adaptive reuse, for instance because balconies cannot be added to the façade.

Building Decree; The requirements in the Building Decree relate to safety, health (air quality and nuisance), usability, energy efficiency and the environment (de Jong, 2003) and are divided into 63 Departments. In 1992, the Building Decree came into force for the first time. This meant that the technical building regulations are laid down in the Building Decree and the related documents, such as the Ministerial Building Planning Act and the designated NEN standards (the so-called first line norms). In 2003, a revised version of the Building Decree appeared, and in 2006 the energy efficiency coefficient was sharpened from 0.8 to 1.0. This last change relates only to new buildings (VROM, 2006).

Financial

There are several factors that affect the cost and therefore also the revenue of transformation projects. The financial factors that can highly determine the success or failure in a transformation project can be divided into three interconnected parts.

Market Demand; There must be a strong market demand in another function, for example housing in order to be able to generate revenue. Without this demand there will not be any buyers.

Building Costs; Are all the costs related to the construction but also the acquisition costs of the vacant office building. It is key to keep the costs as low as possible in order to make the entire transformation project feasible. These costs are interrelated to the building's characteristics. Usually, building characteristics do not make conversion impossible, but they can influence financial feasibility substantially. When conversion costs become too high compared to the expected benefits, conversion may be financially unfeasible. An evident relationship between building costs and the alterations of specific building elements was found after studying several Dutch conversion projects (Mackay, 2009). The major cost generator for most office-to-housing conversions is façade-alteration (27% of the total building costs), followed by interior walls (17% of total building costs) and contractor costs, a group of costs in Dutch estimates combining site costs, general costs of the contractor and his profit (15% of total building costs). Whereas the costs for interior walls depend on the new function and can easily be predicted, the costs related to the facade depend on the building shape, technical state, and quality of the existing building, and on the demand for external appearance, comfort, and quality of the transformed building. The necessity for façade alterations should therefore be thoroughly assessed when studying office-to-housing transformation potential (Geraedts, R.P., D.J.M. van der Voordt and H. Remøy, 2017).

Building Value; Where property owners in the past thought that demand for office space would revert, they are now faced with declining occupancy rates of the worse office property within their portfolio, resulting in a drop in value. Since 2012, more owners are investigating the alternative use of their vacant office property. Transformation or demolition of the vacant office property offers the ability to add value. To transform or demolish vacant office property, financial feasibility is essential, with the residual value playing an important role in determining the value. Although the transformation market is slowly developing due to upcoming incentives, there are still reasons why these projects are not carried out on a large scale. The high book value investors place on their property is one of them. As a result, at first sight, a transformation project is often not financially feasible in advance, or the returns (on these projects for those involved) are not attractive (to be used). A developer calculates with the residual value of a building, which is often lower that the owner's book value. The residual land value is the value that remains when value added tax (VAT), demolition costs, foundation costs, additional costs and profits are deducted from the sales value of real estate. However, due to current market conditions the residual value of the vacant objects is rising. With this gap between book value and residual value closing, then theoretically transformation projects should become more feasible. Through cooperation between market players and local authorities, more transformation and demolition opportunities are being used. This not only has a positive impact on the real estate market, but also the viability and business of locations. The big cities have already benefited greatly from this and have already seen an increase in the residual value. However, only in the major cities. The rising residual value in the major cities is due to the interest of market parties. In small cities e.g. towns, these transformation and demolition opportunities are to a lesser extent. In addition, the residual value in small cities with a level of €400, - per square meter is still well above the residual land value, which usually, after deduction of all additional costs, is between €200, - to €250, - per m^2 LFA amounts (JLL, 2016). However, demolition of office property within these small towns has no advantage to owners. They often choose to leave it empty with all the consequences for the living environment and the activity within these cities. Market parties estimate real estate based on the remaining cash flow (present value of the remaining leases until expiry of the lease agreement) and add a residual value (estimate of the value of the office property upon expiry of the lease agreement). According to JLL (2016) over the years 2012 – 2014 show that the residual value within the small towns has shown a distinctly different course than in the big cities. In 2012, the residual value for both large and small cities was around €600 per m^2 lettable floor area (LFA). Since then the residues of the major cities have risen and stabilized around €700, - per square meter, with the small cities falling to a level of €400, - per square meter LFA (JLL, 2016).

The adaptive capacity of buildings may have a large impact on the future value of buildings. Today's methods for determining the financial feasibility of building conversions do not normally consider this future value sufficiently. The adaptive capacity of a building can only be valued in the use phase of the building when functional and structural adaptions are required. To make buildings that are adaptable in the future usually requires extra initial construction costs. When only considering the initial construction costs, an adaptable building is less attractive than a 'non-adaptable' building (Hermans, 2014). Therefore, not only investment costs should be considered but also the total lifecycle costs. The longer a building is kept in its function instead of becoming vacant or being demolished, the more sustainable that building will be. The adaptive capacity of a building includes all characteristics that enable the building to keep its functionality through changing requirements and circumstances, during its entire technical lifespan and in a sustainable and financially profitable way. The adaptive capacity is considered a crucial component when looking into the sustainability of the real estate stock (Geraedts, 2016).

2.4 Transformation and Rotterdam

When looking more closely to the Dutch office market, regional markets with their own characteristics can be identified. The regional market with the highest vacancy rate is that of Rotterdam, with 18,7% on January 1st, 2017. Looking at table 1 shows that 15,6% is recorded vacant a year later (Cushman&Wakefield, 2018). This is a significant drop but still nowhere near the healthy 4 to 6% and compared to the other major cities Amsterdam (6,7%), The Hague (8,3%), Utrecht (8,1%) this vacancy rate is still extremely high (Financieel Dagblad, 2018). As of May 1st, 2018, there was 15,1% of vacant office space recorded in Rotterdam.

	2013	*2014*	*2015*	*2016*	*2017*	*2018*
Rotterdam	913	1.023	1.017	976	940	733
Amsterdam	1.350	1.700	1.793	1.510	1.151	1.019
The Hague	817	1.023	1.084	1.130	887	675
Utrecht	640	695	687	681	631	498
Netherlands	6.167	7.143	7.285	6.915	6.212	5.292

Table 2, Office space supply x1000m^2 recorded on January 1st, 2018 (Source: Dynamis, 2018; Cushman&Wakefield, 2018)

Of these regional office markets, Rotterdam is the third largest and is traditionally strongly related to its port, the insurance sector and business services. Well-known companies such as Nationale Nederlanden, Loyens&Loeff and Houthoff have a branch in the city. Some of the Netherlands' largest multinationals, such as Shell and Unilever, have established their (head) office in the Rotterdam Central District (RCD).

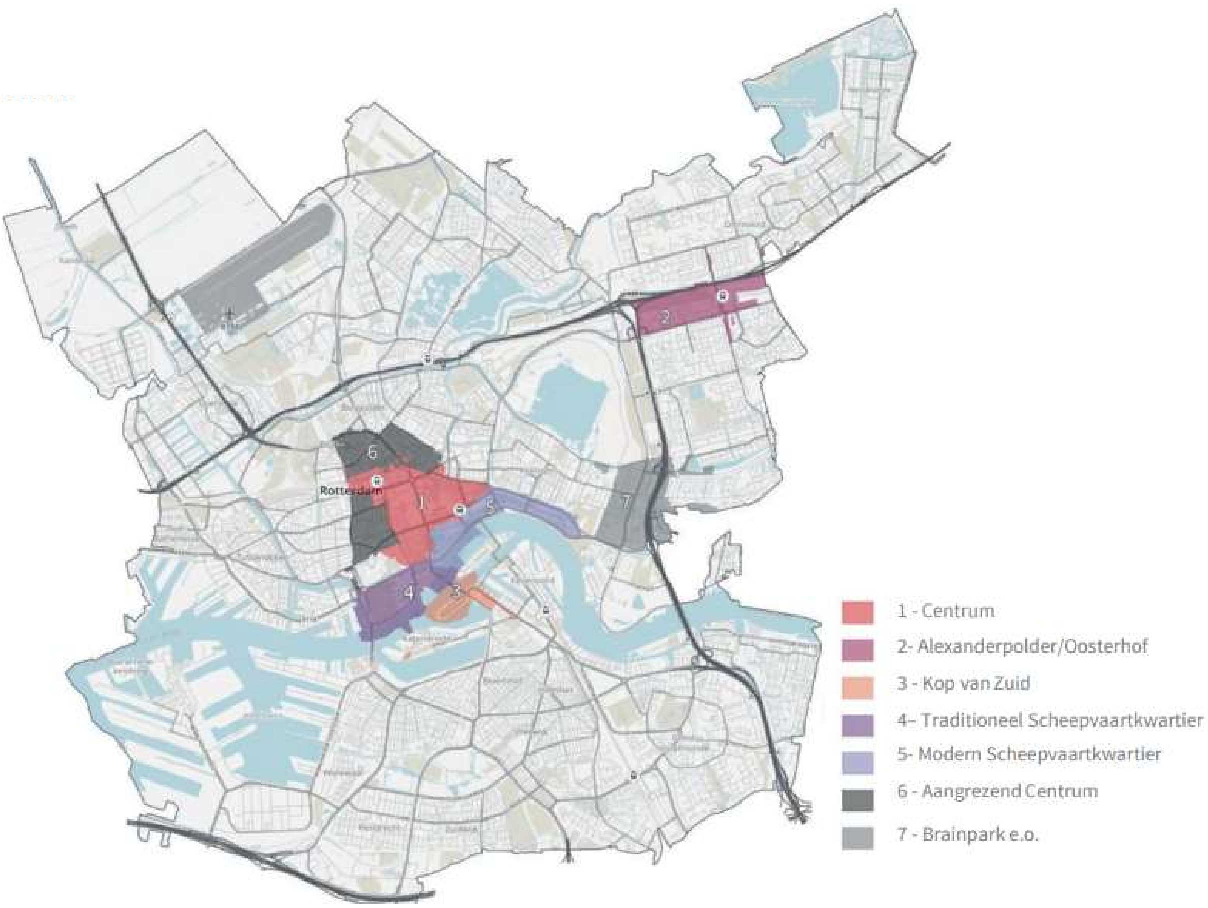


Figure 13, Office areas in Rotterdam (Source: JLL, 2017)

Location

Zooming in on the Rotterdam office market a total of seven office sub-areas can be distinguished, each with its own characteristics (Figure 8). The districts "Centrum" (city center) and "Kop van Zuid" together form the primary office district. The Kop van Zuid has been developed since 2000 and is known for its unique skyline. KPN, Deloitte, Municipality of Rotterdam and Port Authority are large-scale office users here. Modern and traditional shipping quarters are located on the banks of the Maas. Various port-related companies and financial service providers such as EY are located here. Brainpark is located east of the city, on both sides of the A16 highway. Here are single- and multi-tenant office buildings from the nineties that are used by mainly business service providers. Alexanderpolder / Oosterhof is located in the "armpit" of the A16 / A20. Some office buildings there are currently being upgraded, improving this area, and increasing the appeal to new and existing users. Coca Cola, for example, will be housed in the newly renovated MM25 building.

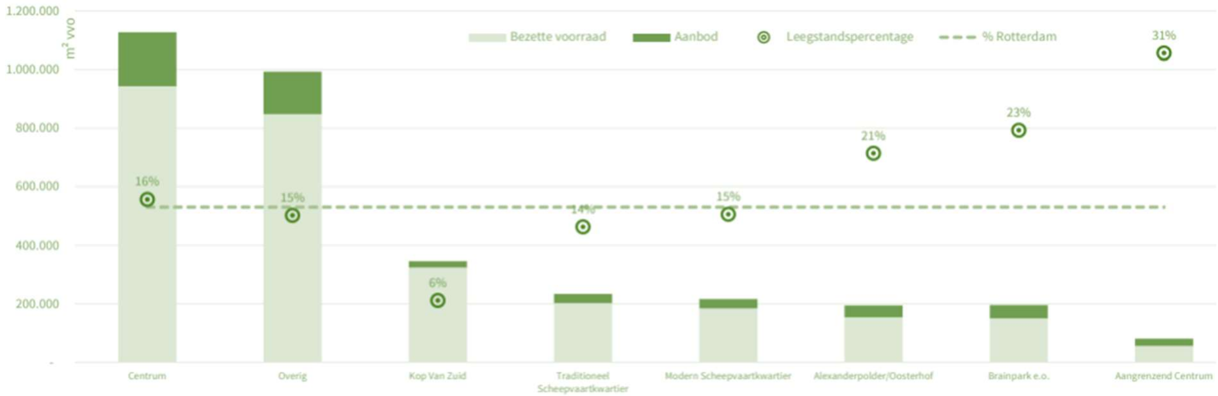


Figure 14, Office stock and vacancy in Rotterdam office locations on DATE (Source: JLL, 2017)

Similar to the country's regional differences there are also differences noticeable looking at the various Rotterdam districts. The vacancy rates of these districts range from a healthy 6% in the Kop van Zuid to a very unhealthy 31% in the districts neighboring the Centrum district (figure 9). Apart from this quantitative mismatch there is, similar to the overall national market, a qualitative mismatch. It's said that the vacancy is mainly due to wrong location for its current use, bad energy performance or a poor external appearance (PropertyNL, 2017). This oversupply should be taken up to get the cities' office vacancy down to healthy levels. This take up is happening through the rising economy, demolition and, transformation. The take up from the rising economy is however mainly in the highest segment or A-segment. Although there is sufficient space in a quantitative sense to welcome new users, available large floor areas are scarce. A large part of the vacancy is of average or B-quality but as shown on the map below on good locations. Again, the poorer quality buildings will remain vacant and over time may become structurally vacant and thus need to put to other use preferably in the most sustainable way i.e. through transformation.

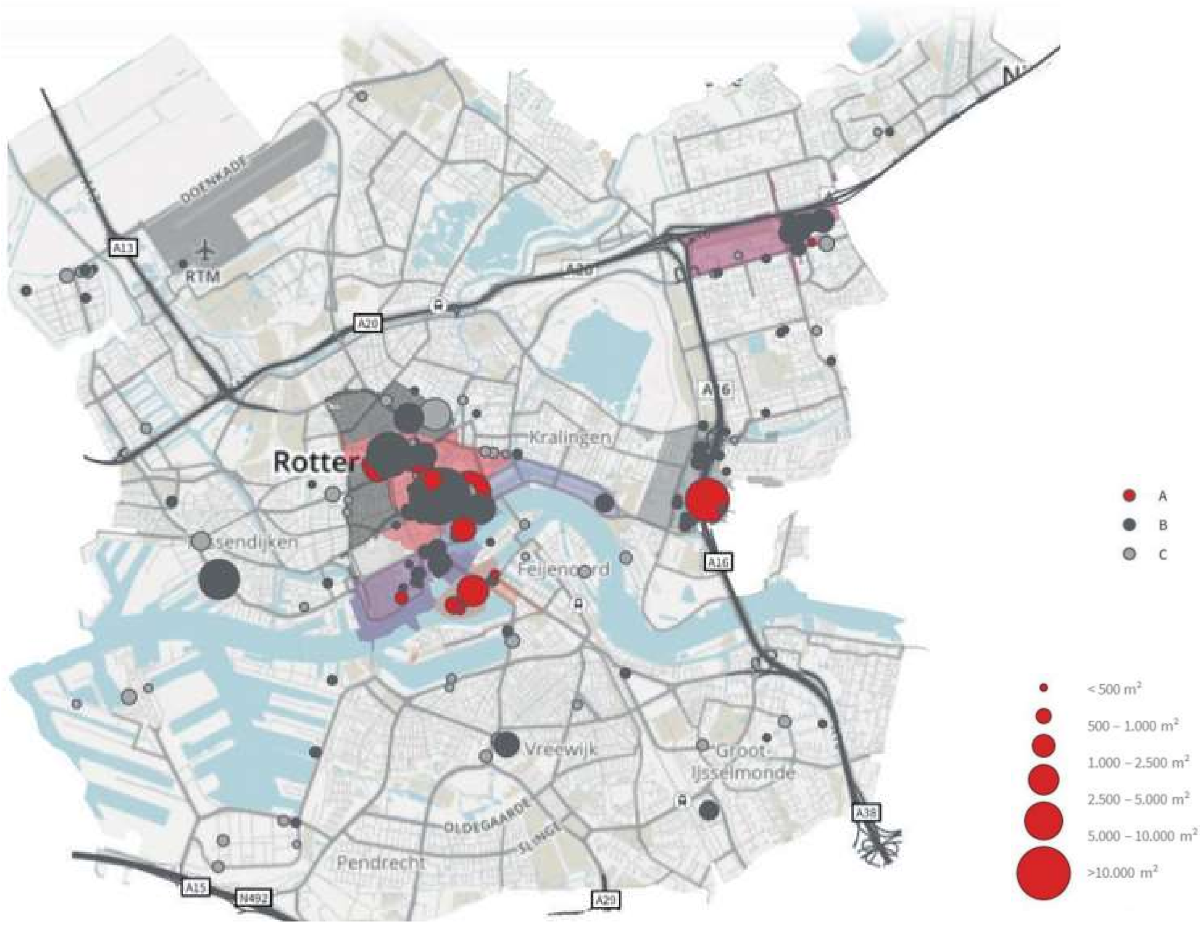


Figure 15, Location and quality of office supply in Rotterdam (Source: JLL, 2017)

The drop in office vacancy in the city of Rotterdam as previously mentioned can be related to active municipal policy to take up vacant office space through demolition and transformation together with market parties. Targets related to taking up office space and increasing housing supply were laid down in an agreement 'Convenant Aanpak Kantorenleegstand' signed together with 23 private companies. In this covenant the municipality of Rotterdam aimed to transform 120.000m^2 of office space to housing between January 1st, 2014 and November 1st, 2017. This set target exceeded. In this period, over 160.000m^2 of office space has been transformed to residential space (Simons, 2017). After the evaluation of first covenant a second agreement was developed: Nieuwe Transformatie Aanpak Kantoren 2016 – 2020 better known as Rotterdam Make it happen. In this agreement there is a set target of 350.000m^2 that should be taken up by either transformation or demolition. More than 1.500 homes are expected to be realized in former office buildings. Also 100.000m^2 of existing office space should be qualitatively upgraded (Simons, 2017). On top of this areas within the city are defined as promising for office space and areas where the main focus should be on transformation.

Promising office area	Transformation area
Rotterdam Central District	Hart van Zuid
Alexandrium	Brainpark
Westblaak	Noordwest
Kop van Zuid	

Table 3, Transformation, and office areas according to covenant 2 (Source: Rotterdam, 2017)

Housing market

Rotterdam, a city in the aforementioned Randstad area, is coping with a shortage. Due to its increased popularity supply cannot keep up with demand. The city currently has 634.660 residents at the end of 2017 which is an increase of over 18.000 new residents compared to 2013. In 2015, Rotterdam had 624,000 inhabitants and in 2016 it grew to 629,000. Growth has been particularly rapid in recent years. The number of residents has increased by 33,500 since 2008. This strong increase will continue. Forecasts show that 2030 in Rotterdam is growing to 676,000 inhabitants. In addition to this population growth, an increase in the number of households is to be expected.

This increasing number together with the ever decreasing household size and the lacking building production in recent years is causing the Rotterdam housing market to overheat. Prices are rising stronger in the big cities compared to the rest of the Netherlands. From 2014 in Rotterdam, as in the Netherlands as a whole, a rise in house prices can be seen again. As a result, the average sales price in the first half of 2016 is above the average sales price in 2008 for the first time. The average price is 308.129 Euro for single family homes (apartments) and 200.804 Euro for (Hypotheker, 2018). On top of that houses are being sold quicker and often above asking price. Sometimes even without reservation of funding or a building report. These are all signs of an overheating market (Wessels, PropertyNL August 2017 p.60). Therefore, a large supply of new homes is needed to keep up with demand.

To increase supply the municipality of Rotterdam aims to build at least 30.000 homes by 2030 (Woonvisie Rotterdam, 2016). This takes shape via:

- New construction at mooring locations, old port sites and restructuring locations;
- Transformation of existing real estate, such as offices, schools, retail spaces / plinths and care homes spread throughout the city;
- More market-based rents, if the (potential) value allows this already or through quality improvement and merging.

In the new construction and transformation program, the municipality gives priority to projects aimed at owner-occupied homes starting at € 180,000 (not only middle-sized, but also high-end sales) and rental properties with a price from € 711 to € 1000 per month. Supply remains far behind the demand in these segments. The Woonvisie 2030 means that Rotterdam wants to continue the current trend of more (expensive) owner-occupied housing (aiming at an increase of 35,000 homes between 2016 and 2030) and less social rental housing (a decrease of 20,000 homes). In this way, Rotterdam must become more attractive for the highly educated and people with a higher income. When the plans of the city council become a reality, in 2030 53% of the houses will be in the (medium) expensive. There are already construction projects, particularly at the Wijnhaven, in Nieuw Kralingen and in De Groene Kaap that are in line with this ambition (Woonvisie 2030, 2016). It is still questionable where to build this amount of new homes. It is hard to find locations due to the city's limited land ownership. Most 'easy' VINEX-locations (Vierde Nota Extra) are mostly developed. Therefore, it is to be expected that the density of certain inner-city locations will be raised (Simons, 2017).

Municipal policy

The Municipality of Rotterdam runs active policy against vacancy in the city. Too much vacancy may lead to poor investment environment and impairment of livability. The municipality is not directly owner of the problem, because this is the owner of the vacant real estate. The municipality however does want a livable city. That is why the municipality helps building owners to put their property in use again. Transformation is one of the possibilities.

In 2011 the municipality of Rotterdam, together with market parties, took the first step towards the vacancy approach through the conclusion of 'the Convenant Approach for Office Vacancy'. The municipality and market parties have agreed to work together to give new offices a new use or to demolish them. Now, more than 4 years later, Rotterdam wants to review the results achieved, and then move ahead with a targeted and full speed. Because even though a lot has been achieved, approximately 300,000 m2 of empty office has been put into use, there is also an extensive task still to come. Almost 10% of all office space in the Netherlands is located in the Rotterdam region, with a total stock of 4.8 million m2 and a vacancy rate of around 21% (01-01-2016). This is a waste of space and money and that is why this figure has to be drastically reduced. Due to the successful approach in recent years in Rotterdam, the market parties and the municipality decided to set up a second covenant for 2016 to 2020. Because there is still much work to be done. The city has a lot of potential and with this new covenant the stakeholders want to use these positive developments to capitalize on the opportunities for the city, the entrepreneurs and the people of Rotterdam. The municipality has a facilitating role in the transformation approach, because the market parties do it. They have the investing capacity. Facilitation means that we continue to focus on accelerating procedures, introducing knowledge and developing new measures together with stakeholders.

2.5 Transformation tools

As seen in previous paragraphs with transformation projects challenges arise on market, locational, functional, technical, cultural, financial, fiscal, legal and organizational level. To gain insight in the possibilities and limitations of these influencing factors many instruments have been developed. Apart from mapping the problem aspects in a project these tools also provide insight into the feasibility of a transformation project. These are the reasons for the existence of these instruments. Three of the most complete, commonly used and researched tools have been selected for this research (Muller, 2008; Fikse, 2008; Voordt, 2007). These tools are the ABT Quickscan (ABT, 2018), the Herbestemmingswijzer (Hek, 2004), and the Conversion Meter 2017 (Geraedts, R.P., D.J.M. van der Voordt and H. Remøy, 2017). These scans or tools aim to incorporate all characteristics i.e. prerequisite related to transformation projects. This paragraph will elaborate on these three tools, how they are used and what their strengths and limitations are. Finally, the three tools are compared and ranked according to a grading system and the most suitable tool for measuring Rotterdam's transformation potential of vacant office space towards housing will be selected.

ABT quick scan

This tool, developed by ABT Consult, gives a more technical approach to transformation projects. This scan does not deal with the market aspects but rather with the technical feasibility of a function in a building. From these technical aspects the financial consequences of fitting a certain function is calculated. The quick scan analyzes 6 aspects of the existing situation. These are: the location, the entrances, the supporting structure, the building exterior, the installations and the interior. Each of these aspects are each assessed on current state, quality and legislation i.e. regulations. The current state goes into the building state how far the elements can continue to function. The quality deals with the possibilities for transformation, the architectural / cultural-historical quality and emotional quality. These are the soft values. When analyzing the regulations, the possible new use of functions is checked against the regulations of the building decree. Here is looked at with the scenario that the building already has this certain new function. With this scan 10 user functions are distinguished: residential function, meeting function, cell function, health function, industry function, office function, accommodation function, education function, sports function and shop function. These functions are taken from the function classification according to the Dutch building decree. These are given a rating, presented with a five-point scale: 1 excellent to 5 poor. From this rating is becomes clear what the future use of the vacant building should be.

Function Analysis Function	1. Excellent	2. Good	3. Reasonable	4. Mediocre	5. Bad	Comments
residential	1					
meeting			3			
cell					5	
health		2				
industry			3			
office				4		
accommodation		2				
education	1					
shop					5	
sports				4		

Figure 16, ABT Quickscan function analysis example

After the function analysis, the costs of reuse can be determined. In principle, this only applies to functions that are good or excellent according to the function analysis. The cost estimate is based on the constructional interventions that are necessary for the elimination of overdue maintenance and defects, the preservation of the architectural qualities and the interventions to have the building comply with the applicable regulations. Also, the ambitions of the client are taken into account here. His quality wishes in the areas of architecture, environment, sustainability, comfort and energy efficiency are combined with the necessary structural interventions. The investment estimate takes place based on NEN 2631. In the building analysis the nature and extent of the materialization of the building are used as a measurable starting point for determining the financial consequences of the proposed interventions. The cost estimate is built up on element level and clearly shows the most important cost units.

Analysis

The ABT Quickscan is meant for anyone who is interested in redeveloping. This is both for the design side, the management side as the development side. It mainly looks at the redevelopment from the supply side. In doing so, it is mainly based on the technical aspects of transformation. The scan is applicable in the initiation phase and has a tactical, almost operational policy level. In addition to the technical aspects, the financial aspect is also part of the scan. However, this is not included i.e. integrated in the model itself. The functional side is limited to the 10 function groups. At the assessment of the suitability of the different function groups a five-point scale is used, which implies a gradual assessment from bad to excellent. A more financial based function analysis will give more useable results of reallocating to a certain function. To complete the scan fully professional help is required. When the user of the model is not someone with an architectural engineering background without experience with construction costs, the correct completion of this model will pose a big challenge. Because the information is extracted from the state of the building according to the standards within the building code. Because it is almost unavoidable to consult an expert the costs of this scan may be higher compared to other scans. However, with the help of this expert a solid technical analysis with a good overview of expected construction costs will be the result.

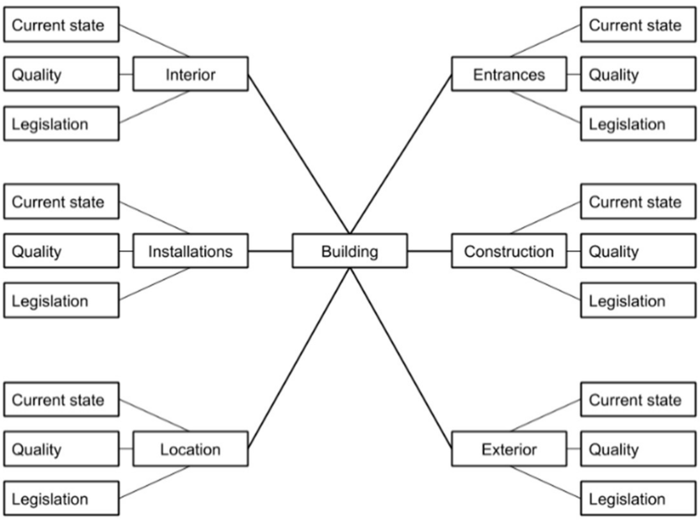


Figure 17, ABT Quickscan current situation scan

Evaluation

The ABT Quickscan pretends to be flexible because it is adaptable to the wishes of the customer. If more information about exploitation and the like is requested this can be supplied and later be added to the base model as shown above in figure 17. In short, the ABT Quickscan a method that looks at the possibilities for a building. The technical feasibility plays the most important role here. After this can elemental construction costs can be calculated but this differs little from the approach at a normal building costs agency and is not involved in the model. As a result, a good overview emerges of the technical state of the building and the associated construction costs for the most plausible function groups.

Herbestemmingswijzer (Redevelopment Guide)

The Redevelopment Guide is a scientifically founded instrument. With the aid of the Redevelopment Guide, a new and substantiated use can be found at the earliest stage, with global knowledge of the building and the location. More often than not monofunctional solutions are thought of when it comes to transformation projects, for example student housing. The Redevelopment Guide also investigates the possibilities of combining functions. A single function solution is however not excluded, but the spectrum of possibilities to be investigated in this tool is broader. By systematically going through the different phases, the new layout of the building is distilled from broad to detailed. The Redevelopment Guide method has four steps or phases.

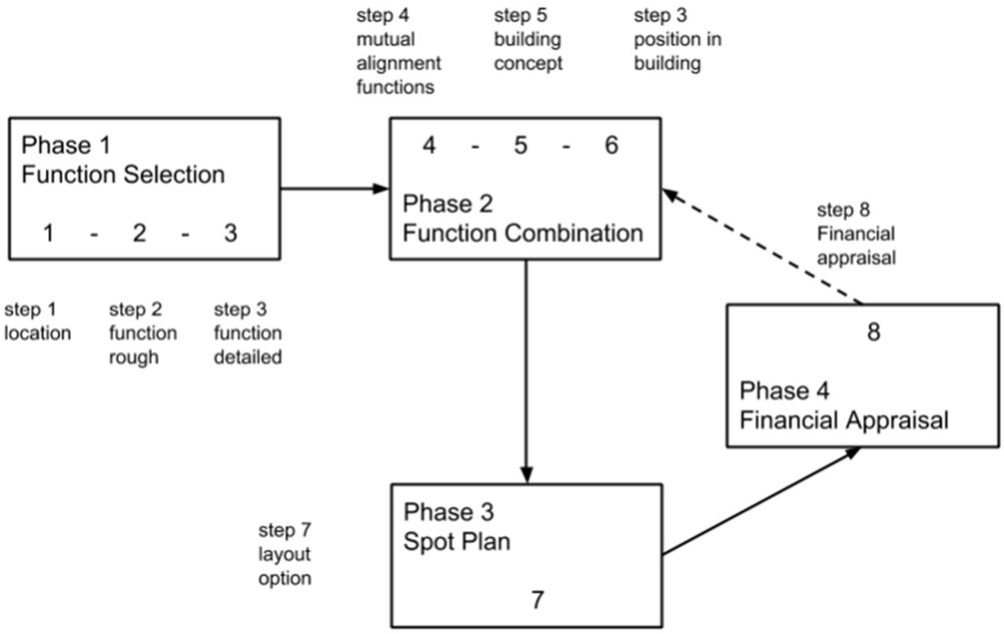


Figure 18, Herbestemmingswijzer phase overview

Phase 1: function selection. In the first phase, the most suitable functions are systematically determined from an overview of all possible destinations (a list with nearly 900 functions). The assessment takes place step by step on the basis of location and social, technical, financial and procedural feasibility. By selecting from broad to detailed, functions that are not suitable for the building are prevented from being tested against all forms of feasibility. By broad is meant that function groups are selected at location level (for example retail and commercial buildings), while fine relates to the specific layout of the building (for example supermarket or clothing store).

Phase 2: function combination. The second phase involves combining, tuning and positioning functions within the building. Within the structure of the existing building, the best possible combinations of the most suitable functions from phase 1 will be sought. Functions will be assessed on combined use.

Phase 3: spot plan. In the third phase, classification variants are developed from the function combinations and the square-meter distribution, the mutual relations and the positioning in the building are determined.

Phase 4. The fourth phase calculates the feasibility of re-use by means of an integral cost approach. A financial exploitation is made for the remaining lifespan of the building. In addition to the investment level, the rent level and / or the sales value of the various (combinations of) functions are determined.

Result. After all the steps of the redevelopment guide have been completed, the outcome is a function or combination of functions that can be accommodated at the specific location and in the existing building. The future completion of the building is such that the individual functions are not directly affected by each other. A building concept for the total building reflects the mutual relationships. Based on this concept, the positioning of functions within the building is set. The size of the functions follows from both the functional classification and the maximization of the financial result. The total building concept is calculated financially to give an opinion about the feasibility of the project. Finally, the results of the Redevelopment Guide and the steps taken are described and displayed in a transparent manner.

Analysis

The technical part is covered per function with 3 criteria: degree of adaptation of construction and support structure, floor load and installations. This is looked at the extent to which the qualifications of the building to be transformed meet the requirements of the function to be placed. The specific building characteristics are left out of consideration. This instrument does not apply to architecture. However, the opinions of local residents are included the instrument. Attention is also paid to the zoning plan and building regulations. Both the function determination and the layout variants are assessed financially. First only on the size of the construction costs, operating costs and rental income. When calculating the layout variants also on the discounted cash flow of the investment, result and Gross Initial Yield. The first part of this instrument, determining the functions and the possible function combinations could be individually well executed when the value judgments per function would be predetermined. In addition, the municipal structural vision, the zoning plan and neighborhood research is needed. Architectural knowledge is required with this tool. The value judgement scores do not automatically come with the model. These are however essential for correct completion of the model. As a result, the general application by users is heavily restricted, since determining these scores yourself is a big job. PRC (the company who made the guide) therefore will remain the ones who can best fill out this instrument. The Redevelopment Guide has been created for architects, investors, governments, developers, municipalities, tenants and other consultancies. Before going through the guide in its entirety, architectural knowledge is needed at both design level and financial level. The guide goes both in on demand as the supply, of the building to be transformed. Both the location as the future function itself. The guide starts in the initiation phase and continues until the sketch design phase of the building process. It has a tactical policy level. In addition, it mainly has a functional and financial approach. The expertise level is not high in the beginning of the guide, however as mentioned above, professional help is needed in the later steps. In the first steps, a gradual measurement is made according to the suitability of the function. Later is financially counted with hard values. After this guide is completed the results can be used to set up a preliminary design.

Evaluation

The Redevelopment Guide is broadly oriented. In the later steps it becomes more detailed however these later steps are less defined and explained. A consultancy firm PRC will have to do the work. It is noticeable that the Redevelopment Guide is a commercial product, because not all data comes with the instrument. Hiring a consulting firm that has this information is therefore necessary. Because the Guide takes up several phases of the building process, a lot of time goes into the instrument. This time would also be lost in the normal process of the construction process without the guide. However, now the Redevelopment Guide now exists as a guide. In short, the Redevelopment Guide is mainly function oriented. This means that the focus of the tool is not on the current technical aspects of the to be transformed property. It looks at the possibilities of different functions and has 3 veto criteria and 12 grading criteria to highlight the best functions. Of the gradual criteria only 4 are related to the building. Compared to other instruments this is limited. The second half of the instrument is more a description of the usual design process.

Conversion Meter 2017

To be able to determine in an efficient and systematic way whether a vacant or to be vacant office building has enough potential to be converted into dwellings, the so-called Transformation Potential Meter has been developed. In short, this is a checklist with veto criteria and gradual criteria, with which it can be determined which characteristics of the location and the building are favorable or unfavorable for successful transformation. Fast and global (quick scan) or more thorough and detailed (feasibility scan). The meter is based on scientific research and has been applied in practice by various market parties. The transformation feasibility of an empty office building is assessed with five steps in this tool.

Step	Action	Level	Outcome
Step 0	Inventory market of unoccupied offices	Stock	Location of unoccupied offices
Step 1	Quick Scan: initial appraisal of unoccupied offices using veto criteria	Location Building	Selection or rejection of offices for further study; GO / NO GO Decision
Step 2	Feasibility scan: Further appraisal using gradual criteria	Location Building	Judgement about transformation potential of office building
Step 3	Determination of transformation class	Location Building	Indicates transformation potential on 5-point scale from excellent to not transformable
Further analysis (optional, and may be performed in reverse order if so desired)			
Step 4	Financial feasibility scan using design	Building	Indicates financial/economic feasibility Sketch and cost-benefit analysis; GO / NO GO Decision
Step 5	Risk assessment checklist	Location Building	Highlights areas of concern in transformation plan; GO / NO GO Decision

Table 4, Overview of Conversion meter steps (Source: Geraedts, R.P., D.J.M. van der Voordt and H. Remøy, 2017)

Step 0: inventory of supply at area level. Before getting started with the Transformation Potential Meter, an inventory must first be made of what long-term vacant offices or offices that will soon be vacant are available in a specific area.

Step 1: quick scan, first exploration and assessment with veto criteria. The instrument offers the user the possibility to initially perform a fast and with little labor and information intensive scan on the basis of 8 veto criteria, divided over the aspects market, location, building and organization. A veto criterion means that when one of the relevant criteria is met, the transformation to homes of the relevant office building is immediately canceled. Further detailed research is then no longer necessary. When considering the potential market in an urban region, a quick selection can be made of interesting buildings in this way.

Step 2: feasibility scan with gradual criteria. If the results of the veto-scan from step 1 are an indication of possible transformation, then in the next stage a more detailed scan with so-called gradual criteria can provide a more accurate picture of the actual transformation possibilities. By gradual criteria is meant that the separate assessment of a criterion does not lead to the approval or rejection of a building, but that the total criteria give a nuanced picture of the transformation potential of a building.

Step 3: determination of the transformation class. After the gradual transformation assessment of both the location and the building, a score can be given to this assessment to determine the transformation class of the building in question. The total score is determined by the total number of yes assessments of the gradual location and building criteria. In the Transformation Potential Meter building and location are assessed in the same step, but location has a heavier weighting in the determination of the final score.

Step 4: scan financial feasibility. If the transformation project is not financially feasible, further development of the plan makes no sense. This financial feasibility depends, among other things, on the purchase price, the state of maintenance, the extent to which the building must be converted or modified, the size and capacity of the building for new homes and the revenues after the renovation in the form of rental income and / or selling prices. In order to determine the financial feasibility, an answer must be given to these costs and benefits related questions. The Transformation Potential Meter uses key figures to test the feasibility of the transformation projects that arrived at step 4.

Step 5: checklist risks planning. If it turns out that the office building in question has the potential to be transformed into dwellings both in terms of location and building and that a first financial feasibility analysis is also positive, a risk analysis can be carried out. In the Meter a risk checklist has been developed with an overview of possible risks or problems and corresponding suggestions for solutions. This list is not exhaustive and is intended as the basis for a project specific risk analysis.

Analysis

From applications of the Transformation Potential Meter it appears that the principle of the meter is good enough to map step by step from rough to detailed for an urban region what the transformation potential is towards housing for certain office buildings. However, a number of criteria from the original version turned out to be too strict. Some buildings that did not meet the veto criteria on paper proved to have been successfully transformed into homes in practice. Criteria such as a minimum size of 20 houses (2000 SQM), a partial vacant or less than three years old, do not appear to have a veto. Moreover, it turned out to be very desirable to combine the transformation Potential Meter with a global financial analysis and also to check at an early stage whether the municipality wants to cooperate with the approval of a zoning plan. That is why a number of such criteria have been added in the latest version of the tool.

Evaluation

The first part of the instrument is suitable for architects, owners, and initiators. However, because only a value for the building aspects and the location aspects can only be given as one score and not for aspects themselves, the instrument is less flexible. The second part, the financial feasibility, requires more specific knowledge and is therefore less suitable for people without a financial and architectural background. To fill out the risk checklist properly and to define the actions that have to be taken to cover the risks require professional expertise. The instrument deals with supply and demand and, as mentioned, concerns building and location. It is applicable in the initiation phase. It is both strategic and tactical and has a functional, technical and financial approach. The information needed can be extracted from the environment, location, construction drawings, municipality and brokers. The sequel to it instrument is to start making a sketch design.

Tool Comparison matrix

In this paragraph the tools are compared to be able to select the most suitable tool for the upcoming task, measuring the transformation potential of Rotterdam's vacant office buildings. The matrix below summarizes the aforementioned paragraphs in which each tool explained, analyzed and evaluated.

Aspects	**ABT Quick Scan**	**Herbestemmingswijzer**	**Transformation Potential Meter 2017**
Market	1	3	3
Location	2	3	4
Technical	5	2	3
Financial	3	2	4
Legal	4	2	3
Functional	3	4	3
Architectural	2	2	1
Stakeholders	0	1	3
User	Architects Investors Governments Developers Tenants	Architects Investors Governments Developers Tenants	Architects Owners Developers
Coverage	Location Building	Location Building	Location Building
Phase	Initiative	Initiative Preliminary design	Initiative
Policy level	Tactical-operational	Tactical	Strategic-tactical
Topics	Technical Financial	Functional Financial	Functional Technical Financial
Expert level	Expert	Expert	Amateur-Expert
Methodology	Grading	Grading	Grading
Sequel	Definition Preliminary design	Provisional/Definitive Design	Definition Preliminary design
Score	**2,25**	**2,5**	**3,125**

Table 5, Comparison matrix

In the matrix above the following grading system is used:

Score	Aspects
0, very poor	Not present in tool
1, poor	Is called in tool
2, fair	Is used to a lesser extent
3, good	Is used in tool
4, very good	Is properly used
5, excellent	Is used completely

Table 6, grading system

Looking at the matrix, the Transformation Potential Meter 2017 receives the highest score, then the Herbestemmingswijzer and last is the ABT Quick Scan. The latter tool comes in last due to its lack of market and locational data. The ABT is mostly about the technical possibilities of the building within the parameters of the building code and the financial output of the necessary interventions needed to transform the building. Therefore, it scores high on technical, financial and legal. The Herbestemmingswijzer is a complicated tool. The experts of PRC are needed to fill out the tool completely. A strong suit is the ability to incorporate multiple uses in the building. Where the other two tools can only implement 1 function, in this case housing. This implementation of the various function is therefore also the main focus of the tool. Similar to the ABT Quick Scan there is a lack of incorporating locational aspects. For this research however, the future function has already been defined. Therefore, this multi-function implementation is of less importance. Since this tool is an expert tool it takes a lot of time to grade a building. The Transformation potential tool is a flexible tool and can be used by experts and amateurs up to step 3. What makes the tool flexible is the ability to add or change veto and gradual criteria to better suit a specific situation or portfolio. This tool also takes into account market and locational factors on top of the technical building related aspects. Also, the time it takes to grade a building in this last tool is considerably less compared to the other two tools. By setting a timer to 1 hour each tool was tested for its usability. Within this hour not a single building was fully graded by using the ABT Quick Scan or the Herbestemmingswijzer. However, in the same amount of time 2 buildings were fully graded using the Transformation Potential Meter, when you take the stakeholder related veto criteria out of consideration. Also, the data needed for this latter tool can be found using publicly available sources which makes the usability even better. However, coming back to the veto criteria. Information about the stakeholder related veto criteria are not publicly available so either assumptions have to be made here, changed from veto to gradual criteria or they should be completely discarded. After comparing the tools, it is clear that the Transformation Potential tool or Conversion Meter 2017 is the most suitable out of the three tools and will therefore be selected to test Rotterdam’s office vacancy for its transformation potential towards housing. As previously suggested alterations may and should be made to better suit the Rotterdam situation and be in line with the findings in previous paragraphs. These changes will be discussed in the next chapter.

2.6 Summary

The office market in the Netherlands has become a replacement market. The cause of this oversupply is mainly due to the fact that office buildings where being developed at own risk during an economic boom. When the bulk was delivered the economy took a turn for the worse leaving these buildings vacant. Prices dropped and other incentives where used to attract tenants. Tenants ultimately then moved. With this tremendous oversupply and lower demand for office space due to among others new ways of working there were no new tenants to occupy the older offices. This has resulted with the bottom end of the market to become structurally vacant. This structural vacancy is still increasing whilst the top of the market (high end offices on the best locations) is starting to show signs of shortage. For the bottom end of the office market function change is necessary because the original function is redundant. Another problematic real estate segment in the Netherlands is the housing market. The Dutch housing market is coping with a shortage and is showing signs of overheating. This overheating is due to smaller households, migration to the urbanized areas, but mainly because of insufficient building production in recent years.

The intervention method transformation may offer possibilities to reduce office vacancy and increase housing supply. Transformation is an intervention method that changes the function of the building. Function change is also obtained with demolition and new build. However, transformation is a more environmentally friendly way of doing so. With transformation the existing structure and other parts of the building are reused, therefore waste is minimized. Considering that the building industry accounts for 25% of all waste, 40% of the total energy consumption in the EU, 80% of the real estate needed for the next 100 years is already built and potentially 50% of this existing stock is suitable for reuse. From a sustainability point of view, all very good reasons to first explore the transformation potential of an object before choosing the fallback option which is demolishing and building new. Since both intervention methods reach the same goal, reduce vacancy and increase housing stock.

For transformation projects to be successful a number of influencing factors are important. The duration of vacancy. The longer a building is empty, the greater the willingness of the current owner to proceed to transformation. Whether cause of vacancy is either market, location or building related also affects the decision if an office building should be transformed or not. The magnitude it affects the decision is greater with market and locational factors and less so with building factors.

When a building is vacant due to market factors, it would not seem desirable to transform the building from an owner's point of view when the market goes up again. If the location is unfavorable for the office organization and whether the building no longer meets the requirements and wishes of office organizations, then reuse can be an interesting option. The condition is that the location has residential potential. In the event of vacancy due to building factors, the transformation potential is highly dependent on the extent to which the building can be transformed into an attractive residential building that meets the requirements and wishes of the intended target groups. Financial feasibility and permission to adapt the zoning plan are critical success factors here.

Good parking facilities, a positive appearance and the character of a work area are favorable location characteristics for re-letting as an office building. Obsolete buildings in the neighborhood, a poor gross-net ratio, low energy performance, and structural aging on the other hand, are unfavorable for rentability as an office building. Properties with these characteristics are more likely to be converted to housing. An important factor is the coordination with municipal policy. When the vacant office building is located in a municipal priority area for housing, transformation to housing is obvious. This then also serves a municipal interest. Buildings in a redevelopment zone for offices or in a designated office area can be better maintained for the office market by adjusting the price or quality through renovation and reuse as an office building.

Transforming vacant offices into homes only makes sense when these homes meet a need. The supply must match the demand, in terms of location and characteristics of the building. Residential preferences show that the different aspects on the demand side differ greatly in importance. People choose residential environments rather on the basis of a total impression than on the explicit presence of specific facilities. Nevertheless, the proximity of shops for daily groceries, public green, and parking in front are in fact important for many people. When it comes to accessibility, accessibility by car is important but also public transport. People mainly pay attention to the distance to public transport facilities. The distances to a tram, bus or metro stop and a train station are therefore relevant variables for the supply profile. Although a high frequency and long opening hours of public transport also contribute to satisfaction with the living situation, these aspects play little or no role in the consideration process of house hunters. The hosing type, entrance and size are decisive for many house hunters when considering whether or not to rent or buy a particular home. The costs, the relationship between price and quality, rent versus purchase and representativeness of the area are also important factors. The layout of the house, finishing level, environmental aspects and general terms and conditions seem to come second. Residential preferences with respect to these variables and priorities that people set differ per target group and depend, among other things, on age, capacity and stage of life.

At first sight Rotterdam seems suitable to expand the transformation market. This city is coping with the highest office vacancy rates recorded amongst all major Dutch cities. Apart from this, its housing market is also overheating. What makes Rotterdam the perfect testing ground to uncovering its transformation potential apart from these two office and housing market factors is the location of the vacant offices. Experts claim that the vacant offices are located less in peripheral areas and more in well connected areas as opposed to other cities in the Netherlands. Also, the municipality of Rotterdam runs active policy against vacancy and aids in speeding up the legislative process and helps bringing market parties together.

As previously mentioned, with transformation projects challenges arise on market, location and, building level. To gain insight in the possibilities and limitations of these challenges or influencing factors many instruments have been developed. Apart from mapping the problem aspects in a project these tools also provide insight into the financial feasibility of a transformation project. These are the reasons for the existence of these instruments. Three of the most complete, commonly used and researched tools have been selected for this research (Muller, 2008; Fikse, 2008; Voordt, 2007). These tools are the ABT Quickscan (ABT, 2018), the Herbestemmingswijzer (Hek, 2004), and the Conversion Meter 2017 (Geraedts, R.P., D.J.M. van der Voordt and H. Remøy, 2017). These scans or tools aim to incorporate all characteristics i.e. prerequisite related to transformation projects as previously mentioned. The most suitable tool to test transformation potential of the selected three is the Conversion Meter 2017. This tool however is not perfect. The main flaw is that it combines the grading of the location and the building in a single step. In order to measure the transformation potential of Rotterdam’s vacant office buildings the original tool will be adapted according to the results from this literature review. In this adapted version location and building will be graded separately and Rotterdam related veto and gradual criteria are added. The adapted tool is shown in the next chapter.

3. Methodology

In chapter 1 methodology was broadly described. This chapter will provide a detailed description of the empirical part of the research. From the theoretical framework a transformation measurement tool was selected to measure the transformation potential of Rotterdam's vacant office space, the Conversion Meter 2017. Before testing can commence, two steps need to be taken. The first step is to adapt the original Conversion Meter 2017 and make it more suitable to test the Rotterdam portfolio. The second step is to select the case studies of the Rotterdam portfolio that will be tested for their transformation potential. This second step is essentially step 0 of both the original and the adapted Conversion Meter.

3.1 Conversion Meter Rotterdam 2018

The original conversion meter comprised of 5 steps. Six actually when counting step 0, inventory market supply of unoccupied offices. This step 0 remains the same. This step will be further explained when the population i.e. all vacant office buildings in Rotterdam are selected in the empirical part of this research. The tables below give an overview of the steps of the Conversion Meter 2017 (CM17) and the adapted version, the Conversion Meter Rotterdam 2018 (CMR18). In this adapted version it can be noted that the feasibility scan of location and building has been separated. From literature we have seen that the location is of greater importance in transformation projects compared to the building itself. Because of this an extra Go / No Go evaluation is built into the CMR18. This additional Go / No Go moment means that in step 2 a minimum score of 15x5=75 is required in order for a structural vacant office building to proceed to the building assessment using gradual criteria. Also, the Risk Assessment is discarded. This list in the original meter was a generic list of risks and possible solutions. Not project specific and also an optional step here. The user of the adapted tool can either opt to make a project specific list of when this user is for example an experienced developer this may be discarded. This does not affect the transformation potential of the vacant office building. On the next page the step overviews are presented of the original tool and the adapted tool, the Conversion Meter Rotterdam 2018 (CMR18).

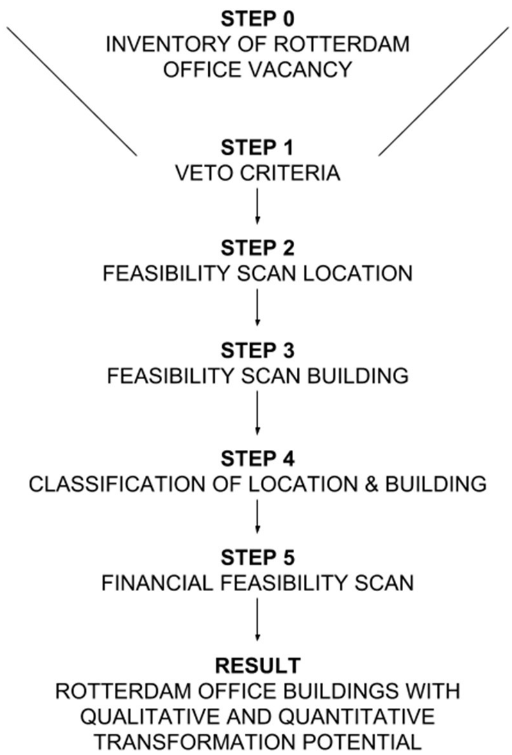


Figure 19, Structure or step overview ***Conversion Meter Rotterdam 2018***

Step	Action	Level	Outcome
Step 0	Inventory market of unoccupied offices	Stock	Location of unoccupied offices
Step 1	Quick Scan: initial appraisal of unoccupied offices using veto criteria	Location Building	Selection or rejection of offices for further study; GO / NO GO Decision
Step 2	Feasibility scan: Further appraisal using gradual criteria	Location Building	Judgement about transformation potential of office building
Step 3	Determination of transformation class	Location Building	Indicates transformation potential on 5-point scale from excellent to not transformable
Further analysis (optional, and may be performed in reverse order if so desired)			
Step 4	Financial feasibility scan using design	Building	Indicates financial/economic feasibility Sketch and cost-benefit analysis; GO / NO GO Decision
Step 5	Risk assessment checklist	Location Building	Highlights areas of concern in transformation plan; GO / NO GO Decision

Table 7, Structure or step overview original ***Conversion Meter 2017***

Step	Action	Level	Outcome
0	Inventory market supply of (partly) vacant office buildings	Stock	Location and characteristics of unoccupied offices
1	**Quick Scan:** initial appraisal of unoccupied offices using veto criteria	Market Location Building	Selection or rejection of offices for further qualitative appraisal; **GO / NO GO Decision**
2	**Feasibility scan:** Further appraisal of location using gradual criteria	Location	Judgement about transformation potential of office building location **Score & GO / NO GO Decision**
3	**Feasibility scan:** Further appraisal of building using gradual criteria	Building	Judgement about transformation potential of office building **Score**
4	Determination of transformation class using location- and building Score	Location Building	Indicates transformation potential on 5-point scale from excellent to no transformation potential **Score & GO / NO GO Decision**
5	**Feasibility scan:** Financials feasibility scan	Building Location	Indicates financial/economic feasibility cost-benefit analysis using market data; **Price & GO / NO GO Decision**

Table 8, Structure or step overview ***Conversion Meter Rotterdam 2018*** *(CMR18)*

This first part has explained the adaptations of the structure or steps of the Conversion Meter Rotterdam 2018 compared to the original tool. In the next paragraphs the content of these steps is elaborated on.

Step 1 quick scan using veto criteria

Step 1 in the adapted version is different compared to the original version. In the original Conversion Meter 2017, 8 aspects are identified with a total of 10 veto criterion. Six of these ten are stakeholder related criterion. In the new version the stakeholders are eliminated as a veto criterion. Reason of this removal is that for this research stakeholders are disregarded. They are in fact important to a project being executed however they do not affect the financial and technical feasibility of a transformation project. Other more willing stakeholders can always be found. The building and its location are immoveable. The latter two are therefore incorporated in the first step of the adapted Conversion Meter. Also, the type of vacancy is not incorporated as a veto criterion. In the adapted version a new veto criterion is added related to the type of vacancy. An office building can only proceed to the next step if it has been vacant for 3 years or longer i.e. structurally vacant.

Step 1 Quick Scan, Initial appraisal of vacant office buildings using veto criteria				
Answer yes (score=1) is positive for conversion into homes. Answer No (score=0) is negative for conversion into homes. With the result quick scan score less then 5 results in a NO GO for further transformation potential appraisal.				
Aspect	**Veto Criterion**	**Data Source**	**Assessment**	
Market			Yes	No
1. Housing demand	1. There is a demand for housing of local target groups	Estate agent Municipality	1	
2. Vacancy type	2. The building is structurally vacant (3 years or longer)	Data sources as shown in 3.2	1	
Location				
3. Urban location	3. Not located in designated office area	Municipal policy	1	
	4. Zoning plan permits modification	Zoning plan Municipal policy	1	
	5. No serious public health risk (pollution, noise, odor)	Data sources as shown in 3.2	1	
Building				
4. Support structure	6. Free ceiling height > 2.60 meter	Estate agent On-site inspection	1	
		Result Quick Scan	5	

Table 9, Step 1 Veto criteria Conversion Meter Rotterdam 2018

Step 2 gradual appraisal of location

In step 2 the location is appraised further using gradual criteria. The original meter consisted of 7 aspects containing 23 gradual appraisal criteria. In the adapted meter the following changes were made:

- Discarded criterion 7 distance to bank / post office. In this day and age with internet banking and email this is a characteristic that will not have an effect on the transformation potential. In the Netherlands the last post office closed its doors on October 27, 2011. There are however still drop-off and pick-up points. (Algemeen Dagblad, 2011)
- Criterion 10. Educational facilities are split into two criteria. The first will be distance to kindergarten up to high school. The second criterion will be distance to higher education up to university. This criterion is separated because the housing type demand is different.
- Discarded criterion 23, land in property or with short lease. Because this information was not obtainable.

Apart from the aforementioned changes the other criteria remain the same in the Conversion Meter Rotterdam 2018. The location of the office building is graded on these 23 gradual criteria. A yes gives a score of 1, a no gives a score of 0. Because the location is of more importance to the success or failure of a transformation project a minimum of 15 points must be obtained in order to proceed to step 3. In this way an extra Go / No Go decision is added. This extra Go / No Go decision amplifies the importance of the location in transformation projects. The way each location criterion is assessed is with the use of Google Maps. By allocating the amenities and measuring the distance from the vacant office building. This applies for criteria 4 to 15. For criterion 1 to 3 and 16 to 20 Google Street View and field trips were used and when available floor plans were used to asses the criteria. For criteria 21 the municipal website was consulted. On this website information can be found about the reputation of the area. Lastly for 22 and 23 noise and air pollution maps where consulted to asses these final two criteria. Each of these gradual location criteria weighs the same. There is no difference of importance between these criteria. As mentioned before the adjustment that has been made to amplify the importance of the location is to separate its grading of that of the building. In comparison to the original meter where these two were combined into one step. The complete list of gradual criteria is shown below in table 10.

Step 2 Further Appraisal Further appraisal of vacant office building location			
Answer yes (score=1) is positive for conversion into homes. Answer No (score=0) is negative for conversion into homes. A score of at least 15 out of 23 must be obtained in order to proceed to the gradual assessment of the building.			
Aspect	**Gradual Criterion**	**Assessment**	
Functional		Yes	No
1. Urban location	1. Building in suitable area (not peripheral)		
	2. Good natural light possibilities		
	3. Good view from building > 75% floor space		
2. Distance and quality of amenities	4. Shop for daily necessities < 500m		
	5. Neighborhood meeting places (square, park) <500m		
	6. Food service industry (bar, café, restaurant) < 500m		
	8. Basic medical facilities (GP, health center) < 2km		
	9. Sports facilities (fitness, swimming pool, sports park) < 2km		
	10. Educational facilities (from kindergarten to high school) < 2km		
	11. Educational facilities higher education <2km		
3. Accessibility by public transport	12. Distance to railway station < 2km		
	13. Distance to bus-, tram-, metro stop < 1km		
4. Accessibility by car	14. Good flow, normal street quality		
	15. distance to parking sites < 250m		
	16. > 1 parking lot / 100SQM office space		
Cultural			
5. representative impression	17. situated centrally (not near highway locations)		
	18. Other buildings present in direct neighborhood		
	19. lively neighborhood		
	20. direct availability of green environment		
	21. Area has a good reputation/image (no vandalism/low crime)		
	22. Area has good air quality and low pollution and noise hindrance		
Legal			
6. Urban location	23. Noise load on façade < 50dB (e.g. max for office building is 60dB)		
	Result Further Appraisal		

Table 10, Step 2 Further location appraisal Conversion Meter Rotterdam 2018

Step 3 Gradual appraisal of building

The buildings that pass the requirements of step 2 will continue to step 3 where the building is appraised further using gradual criteria. The original meter consisted of 14 aspects containing 29 gradual appraisal criteria. In the adapted meter the following changes were made:

- Discarded criterion 4. Building vacant > 3 years. This has already been part of the Quick Scan veto criteria

The remaining 28 gradual criteria remain the same as in the original Conversion Meter. These 28 will be used to further appraise the vacant office buildings in Rotterdam for their transformation potential. Later on, these criteria will be individually assessed by experts. How this expert evaluation is done is elaborated on in paragraph 3.3. After this expert evaluation the entire vacancy portfolio is assessed again using the updated list of gradual criteria. And a comparison of the outcomes is made. For each gradual criterion a yes gives a score of 1, a no gives a score of 0. The scores of steps 2 and step 3 are combined in the next step. Each of the gradual criteria is graded using different methods and sources. All used sources are listed in paragraph 3.2 Population selection. For the further appraisal of the building mostly the floor plans, Google Street View, on-site inspections and the Cadaster were used. The outcomes of the building assessment are presented in the next chapter.

Step 3 Further Appraisal Further appraisal of vacant office building			
Answer yes (score=1) is positive for conversion into homes. Answer No (score=0) is negative for conversion into homes			
Aspect	**Gradual Criterion**	**Assessment**	
Functional		Yes	No
1. year of construction or renovation	1. Building > 3 years		
	2. Building renovated > 3 years		
2. Vacancy	3. Complete building is vacant		
3. New housing	4. Capacity building > 20 1p-units / 50SQM		
	5. Lay outs adaptable for local target groups		
4. Extendibility	6. Horizontal extension building possible (neighboring buildings)		
	7. Vertical extension building possible (no inclined roof / light support structure)		
	8. Possibilities for constructing basement		
Cultural			
5. representative impression	9. Identifiable compared to surrounding buildings		
	10. Own identity realizable		
6. Cultural image	11. Being not a cultural heritage		
7. Access (entrance, elevators, stairs)	12. Clear, safe and clarifying building entrance		
Technical			
8. Condition of maintenance	13. Well maintained; maintenance up to date		
9. Dimensions of support structure	14. Depth of building < 10.00m		
	15. Grid support structure > 3.60m		
	16. Height dimension between floors < 6.00m		
10. Support structure (walls, columns, floors)	17. Condition support structure is good / not hazardous		
	18. Possible connection inner walls on grid < 5.40 m		
11. Façade	19. Façade / openings well adaptable		
	20. Façade windows can be reused / opened		
12. Installations	21. Sufficient service ducts can be constructed		
Legal			
13. Environment	22. Absence of large amount of hazardous materials in building		
	23. Acoustic insulation of floors > 5dB		
	24. Good thermal insulation of facades and roof		
	25. Sufficient daylight factor > 90% floor surface new units		
14. National building decree	26. Elevators available / easy realizable in building (> 4 floors)		
	27. (Emergency) stairways available / realizable		
	28. Distance of new units to stairs / elevators < 50m		
	Result Further Appraisal		

Table 11, Step 3 further building appraisal Conversion Meter Rotterdam 2018

Step 4 Determination of transformation class.

In this fourth step the scores are determined of the further appraisal using gradual criteria. The scores from step 2 and step 3 are combined to give a final score. This score shows the transformation potential of the office building. As mentioned before in the literature review the location is superior to the building when it comes to the feasibility of a transformation project. Therefore, before the scores from step 2 and step 3 are combined, each score is multiplied with a weighing number. The location score is multiplied by 5. The building score is multiplied by 3. With this the greater importance is incorporated mathematically. By doing so a maximum score of 194 can be obtained. Five transformation classes can be identified. Each class is essentially separated by 40 points. This is shown in the table below.

Conversion score	**Conversion class**
Conversion score location + building = 0 - 40	Class 1: No transformation potential
Conversion score location + building = 41 - 80	Class 2: Hardly any transformation potential
Conversion score location + building = 81 - 120	Class 3: Limited transformation potential
Conversion score location + building = 121 - 160	Class 4: High transformation potential
Conversion score location + building = 161 - 194	Class 5: Excellent transformation potential
Maximum score location+ building = 110 + 84 = (22*5) + (28*3) =	194
Total score feasibility scan = A (location) + B (building) =	Score Transformation Potential

Table 12, Step 4 transformation class determination Conversion Meter Rotterdam 2018

Only the high and excellent transformation potentials proceed to step 5 the financial assessment

Step 5 Financials feasibility scan.

For the financial appraisal of the high and excellent transformation potentials the key figures from the Conversion Meter 2017 are used together with current market data. The key figures from CM17 are used to calculate the costs of transformation. The market data is used to calculate the potential income for the specific office building. With this combined information costs and benefits a good first financial analysis can be made if the project is in fact financially feasible, apart from it being a high or excellent potential according to gradual criteria.

Even though a building that has reached step 5 is only partially vacant the total GFA is used for the financial feasibility scan. The steps taken to calculate the potential profit/loss of a transformation project is as follows:

1. Total floor space is calculated of the structural vacant office building
2. Average housing size of the specific neighborhood the structural vacant office building is located in is collected
3. A form factor of 1.3 for the GFA-LFA ratio is set to accommodate the extra facilities/installations needed in residential buildings such as inner walls, extra access points (elevators and stairs) and extra plumbing.
4. The residential unit size is calculated based on the average housing size multiplied by the form factor
5. Units per building calculated by dividing the total floor space with the units per building based on average size multiplied by the form factor.
6. The average SQM price for housing is collected of the neighborhood the office building is located in
7. The total price is calculated by multiplying the average housing SQM price by the total amount of units as calculated in step 5.

The steps taken to calculate the construction costs and acquisition costs are as follows:

1. 2 to 3 room apartments for young couples is the most desired in the whole of Rotterdam and therefore these key figures are used. These key figures are presented in chapter 4 and can also be found in appendix 5.
2. From the key figures selecting the high level of intervention construction costs 1230 Euro per SQM and purchase costs 260 Euro per SQM. In other words, the most pessimistic calculation will be made.
3. (1230 + 260) multiplied by the total floor space results in the total costs

With the costs and benefits calculated ("stichtingskosten" in Dutch) the prospected potential profit can be calculated as follows:

1. Revenue minus costs results in prospected potential profit

This is the first basic calculation of the project. From here more detailed calculations can be made when more information is known about the design, advisors, overheads, etc. This does however give a good first indication if the transformation project is financially feasible after it being graded as high or excellent potential in the previous step.

Step 6 Risk Assessment

The risk assessment from the original Conversion Meter 2017 is completely removed. The risks assessment is something which is done in every building project and not just specifically in transformation projects and is therefore not deemed as a highly affecting influencing factor in the success or failure of such a project. In short, this assessment has little to no effect to the transformation potential.

Summary of adaptations

The updated version will henceforth be named Conversion Meter Rotterdam 2018 (CMR18). What can be concluded from adapting the tool to fit the Rotterdam situation is that structure of the meter has remained the same. A step by step approach using veto and gradual criteria. The number of steps and the content of these veto and gradual criteria has changed. The previously described changes that have been made to the Conversion Meter 2017 to create the Conversion Meter Rotterdam 2018 are summarized below:

- Veto criteria
    - Rotterdam specific locational veto criteria added
    - Type of vacancy specification added to veto criteria
    - Stakeholder related veto criteria discarded from veto criteria
- Location and building graded separately
- Extra go / no go moment built in after the location appraisal using gradual criteria
- Gradual location grading changes
    - Discarded criterion 7 distance to bank / post office. In this day and age with internet banking and email this is a characteristic that will not have an effect on the transformation potential
    - Criterion 10. Educational facilities are split into two criteria. The first will be distance to kindergarten up to high school. The second criterion will be distance to higher education up to university. This criterion is separated because the housing type demand is different.
    - Discarded criterion 23, land in property or with short lease. Because this information was not obtainable.
- Gradual building grading changes
    - Type of vacancy moved to veto criteria
- Financial assessment
    - No changes
    - Input from original meter to calculate costs
    - Input from market data to calculate potential income
- Risk checklist
    - Fully discarded

3.2 Population selection

With the tool built, it needs to be tested. The testing of the tool serves two purposes. First, to test the usability of the tool itself. Second, to uncover the transformation potential of Rotterdam's vacant office buildings. To perform the case study testing, cases must be selected. This part describes the selection method of the cases (read office buildings) and which cases are selected.

Selection of area – districts – neighborhoods

As previously mentioned Rotterdam's office market will be used to test the tool. The four main reasons for selecting this area are because it's the area with highest percentage of office vacancy in the Netherlands, an area coping with an overheating or tight housing market, a cooperative municipality and the vacant offices are supposedly located on high potential locations according to some experts.

The case studies that will be selected for this study are all vacant office buildings located in the urbanized parts of Rotterdam, figure 19. Meaning that the districts Hoek van Holland, Rozenburg, Pernis, Heiplaat and Waalhaven are not measured for their transformation potential. Reason being that there is hardly any office vacancy here and there are still a lot of port activities going on in these districts. Transforming these districts now is not relevant since there is no demand for living there, no tight housing market. Maybe in the future it could become more interesting just as Delfshaven, Kop van Zuid, Katendrecht used to be port areas and have become upcoming residential areas.

Figure 20, map of selected population (Source: Municipality of Rotterdam, 2018)

Apart from listing building information on all vacant office buildings themselves also data about the area in which the buildings are located is gathered. This information is needed to be able to run all steps of the adapted conversion meter. The city of Rotterdam is divided in 14 districts. Discarding the four aforementioned districts ten districts remain. Listed below are the 10 districts. Subsequently these 10 districts are comprised of 65 neighborhoods. Each of these neighborhoods have their own locational characteristics.

District	Neighborhood	District	Neighborhood
1. Centrum (City Center)	1. Cool 2. Stadsdriehoek 3. Oude Westen 4. Nieuwe Werk-Dijkzigt	**6. Ijsselmonde**	36. Beverwaard 37. Groot Ijsselmonde-Noord 38. Groot Ijsselmonde-Zuid 39. Lombardijen 40. Oud Ijsselmonde
2. Charlois	5. Carnisse 6. Heijplaat 7. Oud-Charlois 8. Pendrecht 9. Tarwewijk 10. Wielewaal 11. Zuiderpark&Zuidrand 12. Zuidplein 13. Zuidwijk	**7. Kralingen-Crooswijk**	41. De Esch 42. Kralingen Oost&Kralingse Bos 43. Kralingen West 44. Nieuw Crooswijk 45. Oud Crooswijk 46. Rubroek 47. Struisenburg
3. Delfshaven	14. Bospolder 15. Delfshaven 16. Middelland 17. Nieuwe Westen 18. Oud Mathenesse& Witte Dorp 19. Schiemond 20. Spangen 21. Tussendijken	**8. Noord**	48. Agniesebuurt 49. Bergpolder 50. Blijdorp&Blijdorpsepolder 51. Liskwartier 52. Oude Noorden 53. Provenierswijk
4. Feijenoord	22. Afrikaanderwijk 23. Bloemhof 24. Feijenoord 25. Hillesluis 26. Katendrecht 27. Kop van Zuid 28. Kop van Zuid-Entrepot 29. Noordereiland 30. Vreewijk	**9. Overschie**	54. Kleinpolder 55. Noordkethel-Schieveen-Zestienhoven-Landzicht 56. Overschie 57. Spaanse Polder
5. Hillegersberg-Schiebroek	31. Hillegersberg-Noord 32. Hillegersberg-Zuid 33. Molenlaankwartier 34. Schiebroek 35. Terbregge	**10. Prins Alexander**	58. Het Lage Land 59. Kralingseveer 60. Nesselande 61. Ommoord 62. Oosterflank 63. Prinsenland 64. ‘s-Gravenland 65. Zevenkamp

Table 13, List of population districts and neighborhoods (Source: Municipality of Rotterdam, 2018)

For this study, all vacant office buildings located within the selected 10 districts of Rotterdam are selected. For selecting the population multiple publicly available data sources were consulted. These are:

1. Funda in Business,
2. BAG Viewer
3. Interactive Supply Map
4. Google Maps
5. Current height file map (Actueel hoogte bestand)
6. Cadaster
7. PropertyNL
8. Fifteen real estate agent websites
9. On site inspections

These 21 sources where cross referenced to collect all necessary data on the vacant office buildings to be able to complete all step of the Conversion Meter Rotterdam 2018. The building information that was gathered on all vacant office buildings are:

1. District
2. Neighborhood
3. Postcode
4. Address
5. SQM for rent
6. Total LFA
7. Vacancy percentage
8. Vacancy Duration in months
9. Office rental price SQM/Year in Euro
10. Year of construction
11. Energy label
12. Amount of floors
13. Building height in meter
14. Floor to ceiling height in meter
15. Located in designated office zone (Y/N)
16. Located in designated transformation zone (Y/N)

Apart from information on the structural vacant office buildings themselves also locational data is needed to run all steps of the adapted tool. For the locational data six additional sources where consulted. These are:

1. CBS
2. Cadaster
3. Google Maps
4. Conversion Meter 2017
5. Huizenzoeker.nl
6. Weetmeer.nl

This locational information can be grouped into three categories. Housing market, demographics and amenities. For each neighborhood the following data was collected using the previously mentioned sources.

Housing market

1. Average selling price
2. Average price per SQM
3. Average floor space in SQM
4. Most common housing types
5. Building period

Demographics

1. Number of residents
2. Number of households
3. People per household
4. Household formation
5. Average age
6. Average income

Amenities

1. Distance to supermarket in km
2. On-ramp to highway in km
3. Distance to train station in km
4. Distance to hospital in km
5. Distance to general practitioner in km
6. Distance to cinema in km
7. Distance to restaurant in km
8. Distance to swimming pool in km
9. Distance to day care in km
10. Distance to elementary school in km
11. Distance to high school in km
12. Distance to higher education in km

The complete data base can be found in Appendix 1.

3.3 Evaluation of findings by experts from practice

After the vacant offices located in the selected districts of Rotterdam have been tested for their transformation potential, the tool and the results will be evaluated. The evaluation will be done by experts. The experts that will be selected for the evaluation are professional real estate developers whose expertise are transformation projects. These experts will evaluate the tool on methodology and content. Are the used veto and gradual criteria in line with what these experts use to assess a buildings' transformation potential? Also, the output will be evaluated. Can the insight the output gives be used to initiate a transformation project? The aim of this expert evaluation is to uncover if the Conversion Meter Rotterdam 2018is in fact a tool that may be implemented e.g. used in practice.

The setup of the expert evaluation is as follows. First the tool and the results well be presented. After this brief presentation the use of this model will be shown using a case study to go through all the steps. In this way each step can be discussed and evaluated by the experts. What do they think of the step by step approach from broad to detailed, the veto and gradual criteria, the used input and the output? The experts will also be asked if there are criteria that they would add, discard or change. This input will be processed into a new version of the Conversion Meter Rotterdam 2018. Then the entire Rotterdam vacant office portfolio will be tested with this updated version. Then a comparison is made between the results of each version. The Conversion Meter Rotterdam 2018 and the Conversion Meter Rotterdam 2018 Expert. The highlights of this discussion are then presented in the next chapter.

With this approach an extra evaluation the original Conversion Meter 2017 is implemented. In this way the original tool is revised and updated in two ways. First with the use of the theoretical framework and Rotterdam specific factors. This created the Conversion Meter Rotterdam 2018. Then this tool is evaluated by experts in the field of transformation projects, resulting in the Conversion Meter Rotterdam 2018 Expert. The entire portfolio of Rotterdam's vacant office buildings will then be assessed for their transformation, using this second update of the original tool. These results will be compared with the first update. Results of the Conversion Meter Rotterdam 2018 compared to Conversion Meter Rotterdam 2018 Expert.

4. Empirical research

This chapter is the empirical part of the thesis. In the previous chapter the measuring tool has been made ready to use and the steps of selecting the vacant office buildings specified. In this chapter the collected data, read case studies, are processed through the adapted measuring tool: Conversion Meter 2018. The insight the results will give, may be used to aligning demand and supply in Rotterdam's office and housing market. Ultimately, showing how significantly office vacancy and housing shortage can be reduced in Rotterdam.

4.1 Theoretical outcome

Before the empirical testing will commence, a theoretical prediction according to the finding from the literature review is made. This can then be compared to the empirical outcomes of this study. From theory we have seen that at first sight the situation in Rotterdam may offer possibilities for expanding the transformation market of office space into housing, due to its high office vacancy rates, the location of its structural vacant office space and its tight housing market. An advantage of the Rotterdam office market is more than half of the vacancy is either in or close to the city center, which are considered to be suitable locations for redevelopment (Nederpelt, 2015; PropertyNL, 2017). For transformation projects to be successful, a number of factors are important. These include among others, a tight market of the future function, for example housing, locational factors and building characteristics. Experts say that around 50% of vacant office space meet the requirements and are therefore suitable for transformation (Remøy, 2014). Transformation potential has already been measured by PBL and Brink. However, the transformation potential conducted in this research focused solely on areas defined by them as underused. This research explicitly leaves out the individual transformation potential of vacant buildings. The research however does mention that on average about 5% of the 1.000.000 housing demand can be realized in existing vacant stock (Brink, 2017). Meaning about 50.000 homes could be added in the currently vacant objects in the Netherlands. To summarize the hypothesis that will be tested are:

- An advantage of the Rotterdam office market is that more than half of its vacancy is either in or close to the city center and therefore suitable for transformation (Nederpelt, 2015).
- 50% of office space is suitable for transformation (Remoy, 2017)
- 5% of the Dutch housing demand of 1 million units (50.000) can be realized in existing stock (PBL & Brink, 2017)

In Rotterdam 15.1% of its total office stock was recorded as vacant on May 1st, 2018 (Financieel Dagblad, 2018). 15.1 - 5 = 10.1% must be taken up or withdrawn either through transformation or demolition to get Rotterdam's office market down to healthy levels (4 to 6%). The actual part to be taken up through transformation are all redundant office buildings or structural vacant office buildings. Theoretically 50% of these structural vacant objects should be suitable for transformation. 248.777m^2 is structurally vacant across 62 buildings with a combined floor space of 619.621m^2. Again, 50% of the structural vacant office space or 31 buildings accumulating to approximately 310.000m^2 should be suitable for transformation according to theory. On average 310.000m^2/(95m^{2}x1,3) = 2.510 residential units can be realized through transformation in Rotterdam. Using a form factor of 1.3 to accommodate for hall ways, inner walls, staircases, elevators etc. Suitable transformation floor space 310.000m^2 & Average selling price per sqm €2.656,70. Selecting the 2/3 bedroom apartment with high level of intervention resulting in €1.230 per m^2 construction costs and €260 per m^2 acquisition costs. This is in demand by the main target group, young couples, and young urban professionals. (95m^2 x 2.510 residential units x €2.656,70) – (€1.230 + €260) x 310.000m^2 = €633.490.115 revenue – €461.900.000 costs = €171.590.115 potential profit.

4.2 Testing Rotterdam's portfolio

Step 1. Quick scan using veto criteria

The first step of the adapted conversion meter is grading Rotterdam's office vacancy using veto criterion. If one of the six criteria are not met, the case will not proceed to the next step. The table below gives an overview of the veto criteria and the scores.

Step 1 Quick Scan, Initial appraisal of vacant office buildings using veto criteria				
Answer yes (score=1) is positive for conversion into homes. Answer No (score=0) is negative for conversion into homes. With the result quick scan score less then 5 results in a NO GO for further transformation potential appraisal.				
Aspect	**Veto Criterion**	**Data Source**	**Assessment**	
Market			Yes	No
1. Housing demand	1. There is a demand for housing of local target groups	Estate agent Municipality	Yes	No
2. Vacancy type	2. The building is structurally vacant (3 years or longer)	Data sources as shown in 3.2	Yes 62	No 314
Location				
3. Urban location	3. Located in designated office area	Municipal policy	Yes 45	No 17
	4. Zoning plan permits modification	Zoning plan Municipal policy	Yes 45	No 0
	5. No serious public health risk (pollution, noise, odor)	Data sources as shown in 3.2	Yes 45	No 0
Building				
4. Support structure	6. Free ceiling height > 2.60 meter	Estate agent On-site inspection	Yes 45	No 0
		Result Quick Scan	45	

Table 14, Step 1 Veto Criteria Conversion Meter Rotterdam 2018

The first aspect of step 1 is market, identifying housing demand. As discovered in chapter one, the housing market of Rotterdam is overheating. Meaning there is a strong demand for housing. This accounts for all Rotterdam districts when zooming in on the local markets. Therefore, the assessment of the first veto criterion is a yes. What is also already identified is the high vacancy in Rotterdam. As pointed out in the previous paragraph Rotterdam's vacancy rate is 15,1% recorded on May 1st, 2018. However, the second veto criterion demands a specification of the type of vacancy. On this date there were 376 fully and / or partly vacant office buildings located in Rotterdam. From the literature review we have seen that there are three types of vacancy. Office vacancy can be divided into three categories: frictional vacancy (0 to 12 months), long term vacancy (13 to 36 months) and structural vacancy (37 months or longer). Only the structural vacant office buildings will receive a "yes" assessment score because here the function office is redundant. Of those 376 (partly) vacant office buildings 142 were recorded as frictional vacant, 172 long term vacant and 62 as structural vacant. These structurally vacant offices are mapped below in figure 21. The structural vacancy amounts to 248.777m^2 structurally vacant office space divided over 62 buildings with a combined LFA of 619.621m^2. Being structurally vacant only refers to the time the office building has been vacant and not the percentage the building is vacant.

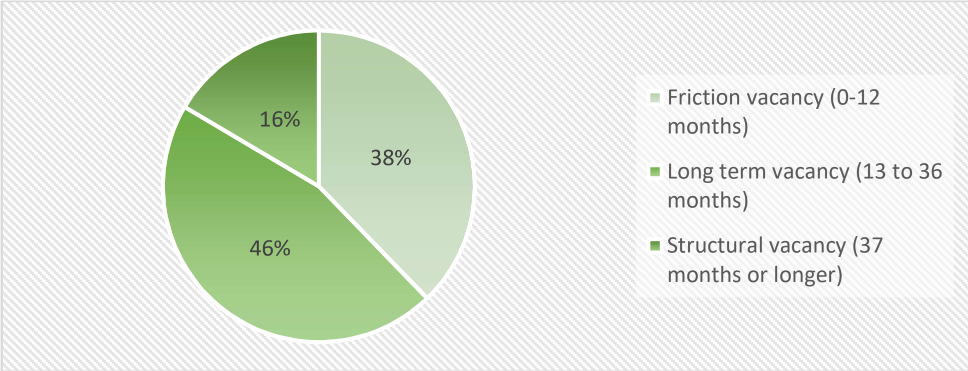


Figure 21, Distribution of type of vacancy in Rotterdam

Only 8 of the 62 structurally vacant buildings are completely vacant. The remaining 54 still have 1 or more tenants in place. These remaining tenants still occupy 619.621.950m^2-248.777m^2=370.844m^2 of floor space. Structural vacancy occurs in all but one district. Only the district of Overschie does not have a structurally vacant office building. The map below shows all structural vacant objects within the previously selected urbanized part of Rotterdam. It is noticeable that the structural vacancy is mostly concentrated in and directly around the city center.

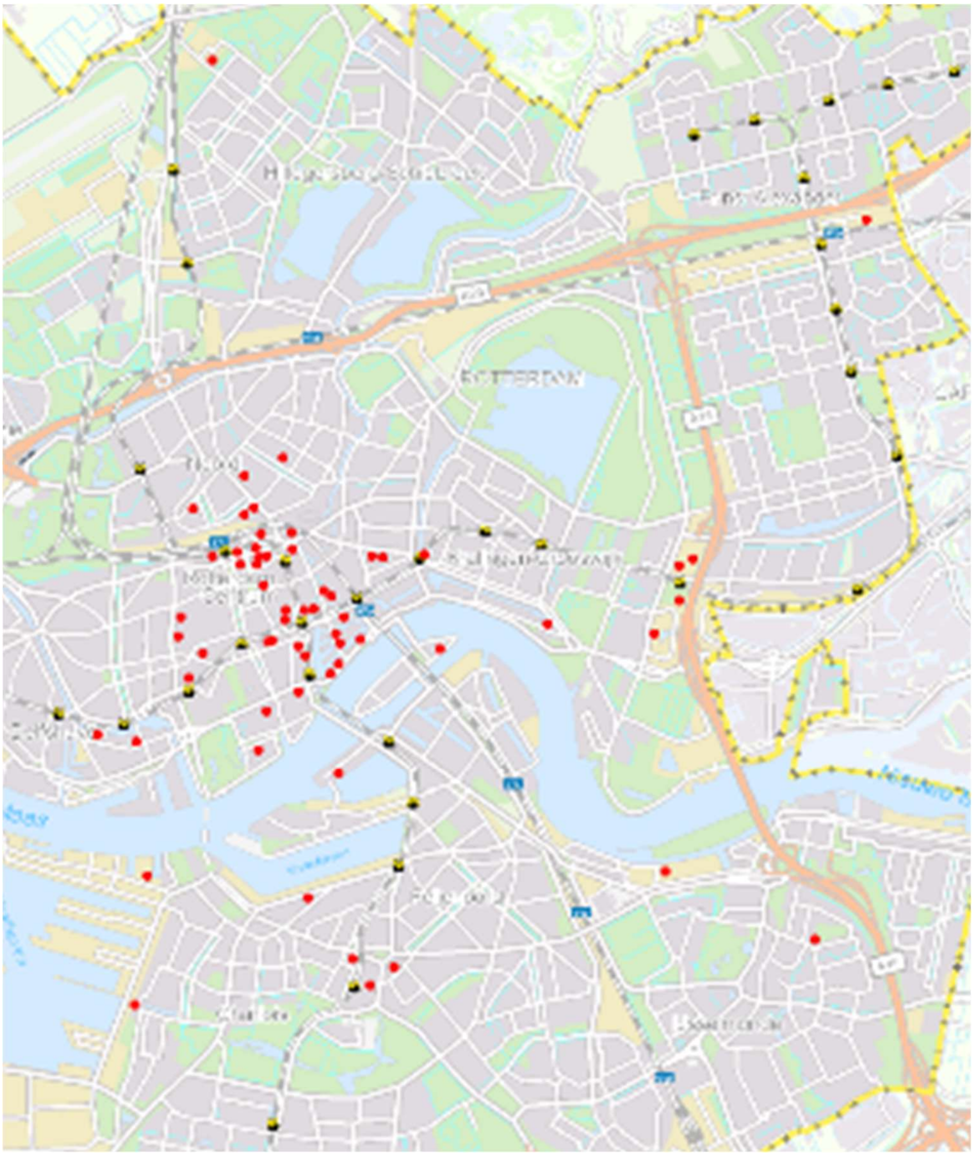


Figure 22, Location of structural vacant office buildings in Rotterdam

The third veto criterion is about location. The first locational veto assessment is if the structural vacant office building is located in an area designated office area by the municipality of Rotterdam. Area's that are designated for office use are the Rotterdam Central District towards Blaak (Weena, Coolsingel, Blaak), the Kop van Zuid and Alexandrium (Rotterdam, 2017). Office space in these areas are to remain office space. Application to modification of the zoning plan will be declined by the municipality. Of the 62 office buildings coping with structural vacancy, 17 are located within one of those three office areas. Now 62 – 17 = 45 structural vacant office buildings will proceed to the next veto criterion.

This next criterion is about air quality and noise nuisance. Firstly, a residential building is allowed in an area that in which more than 50dB is produced however extra measures are required to reduce nuisance within the building. The map below shows the noise pollution in Rotterdam. Road and railway traffic are the main sources of nuisance in and around Rotterdam. Vacant office buildings located within a highlighted area can still be a successful transformation project. However, the costs will be higher due to the extra measures that need to be taken. None of the remaining 45 office buildings are located in an area highlighted on the map below.

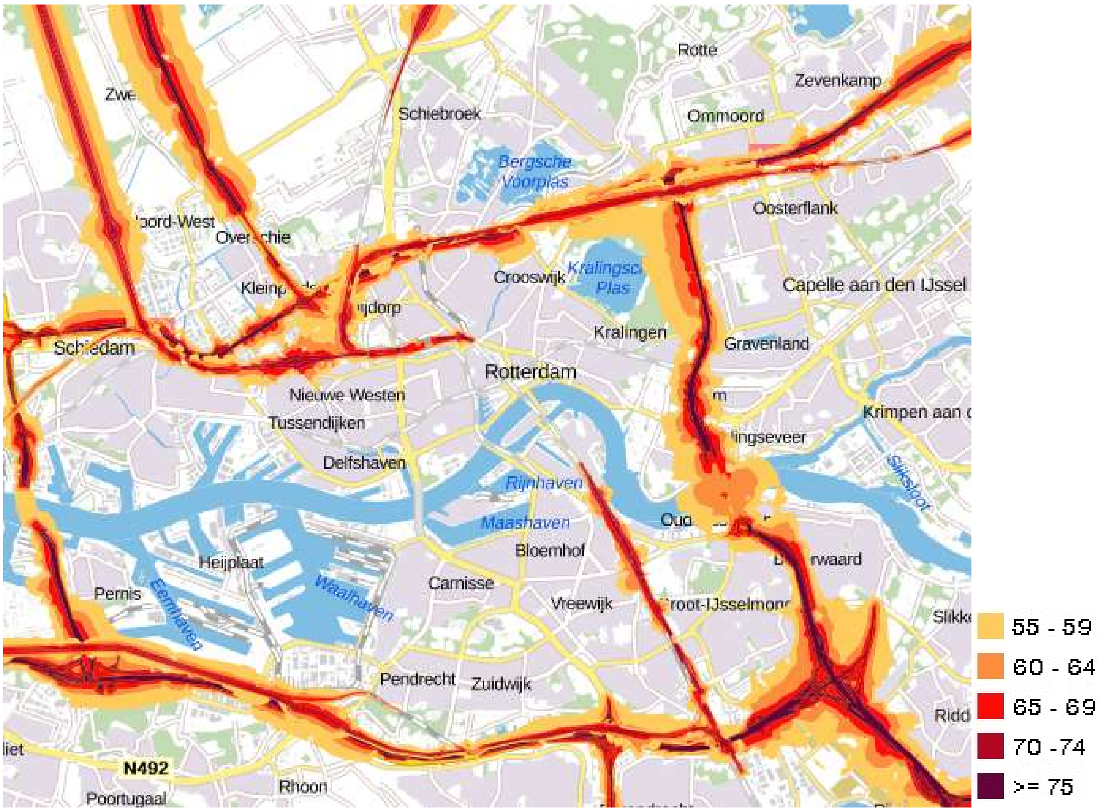


Figure 23, Map of noise pollution in dB of road and railway traffic (Source: Pdok, 2018)

The air quality a residential building is located at cannot be a serious health hazard. Air quality in the Rijnmond region has improved considerably in recent years, yet there are still harmful substances in the air. This in part is due to the industry and the heavy traffic in the region. Air pollution can be harmful to people, but also to nature, the climate, and buildings. Through research it becomes increasingly clear which substances in the air are the most harmful and which measures must be taken to improve air quality and health (GGD Rotterdam Rijnmond, 2018). The National Institute for Public Health and the Environment (RIVM) monitors air quality throughout the Netherlands. The RIVM measures the amount of nitrogen dioxide, sulfur dioxide, ozone, and particulate matter in the air at various locations in the Netherlands. The map below shows the current air quality in Rotterdam, which is good according to the RIVM (RIVM, 2018). This is air quality allowed for the development of residential space. Therefore all 45 remaining structural vacant office buildings will proceed to the next veto criterion.

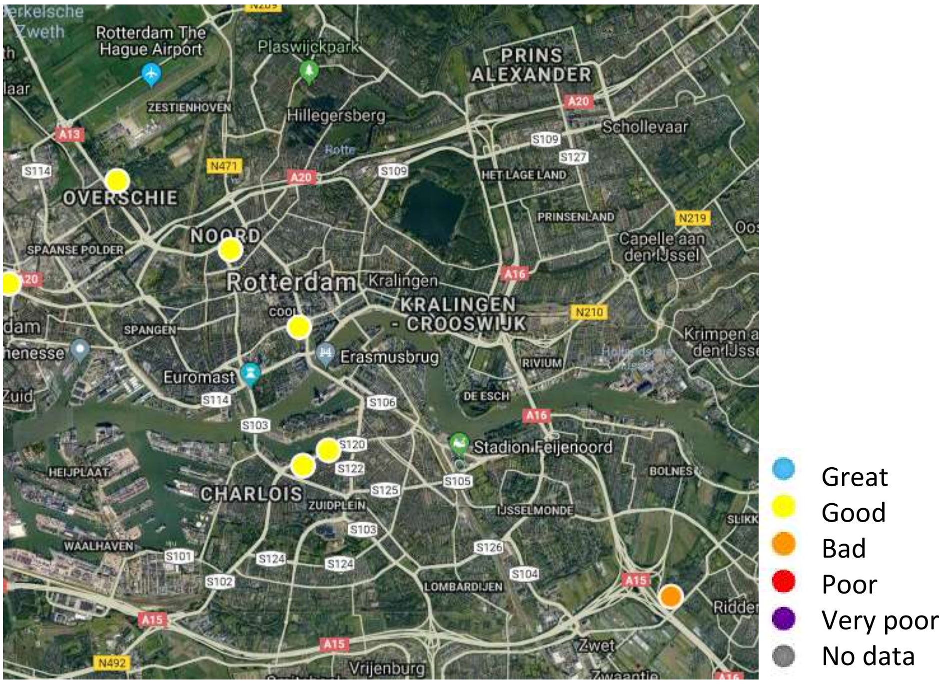


Figure 24, Map of air quality in Rotterdam (Source: Luchtmeetnet, 2018)

The next veto criterion is that of floor to ceiling height. This criterion is mandatory from a legislative viewpoint. The Dutch building decree states that housing must have a free floor to ceiling height of at least 2.6 meter. The method used to determine this is as follows. First all previously mentioned sources were consulted. In some cases, these showed the floor to ceiling height or it could be calculated with the provided data. However, for most cases this had to be calculated using another source. In order to calculate this, two variables had to be found, building height and number of floors. Building height could be obtained through the source Current Height File Netherlands (Actueel Hoogtebestand Nederland). As shown below on figure 24**,** this website shows the exact height of each surface in the Netherlands. Next the number of floors had to be determined. This was done by simply counting them either using Google Maps Streetview or with on-site inspections. Of the 45 structural vacant office buildings all passed the floor to ceiling height of 2.6 meter veto criterion.

Figure 25, Map of building heights in Rotterdam (Source: actueel hoogtebestand Nederland, 2018)

Step 1 of the Conversion Meter Rotterdam 2018 is visualized in figure 25 below. The process visualized below is done to each building by each criterion starting here with the veto criteria and the proceeding to the gradual criteria.

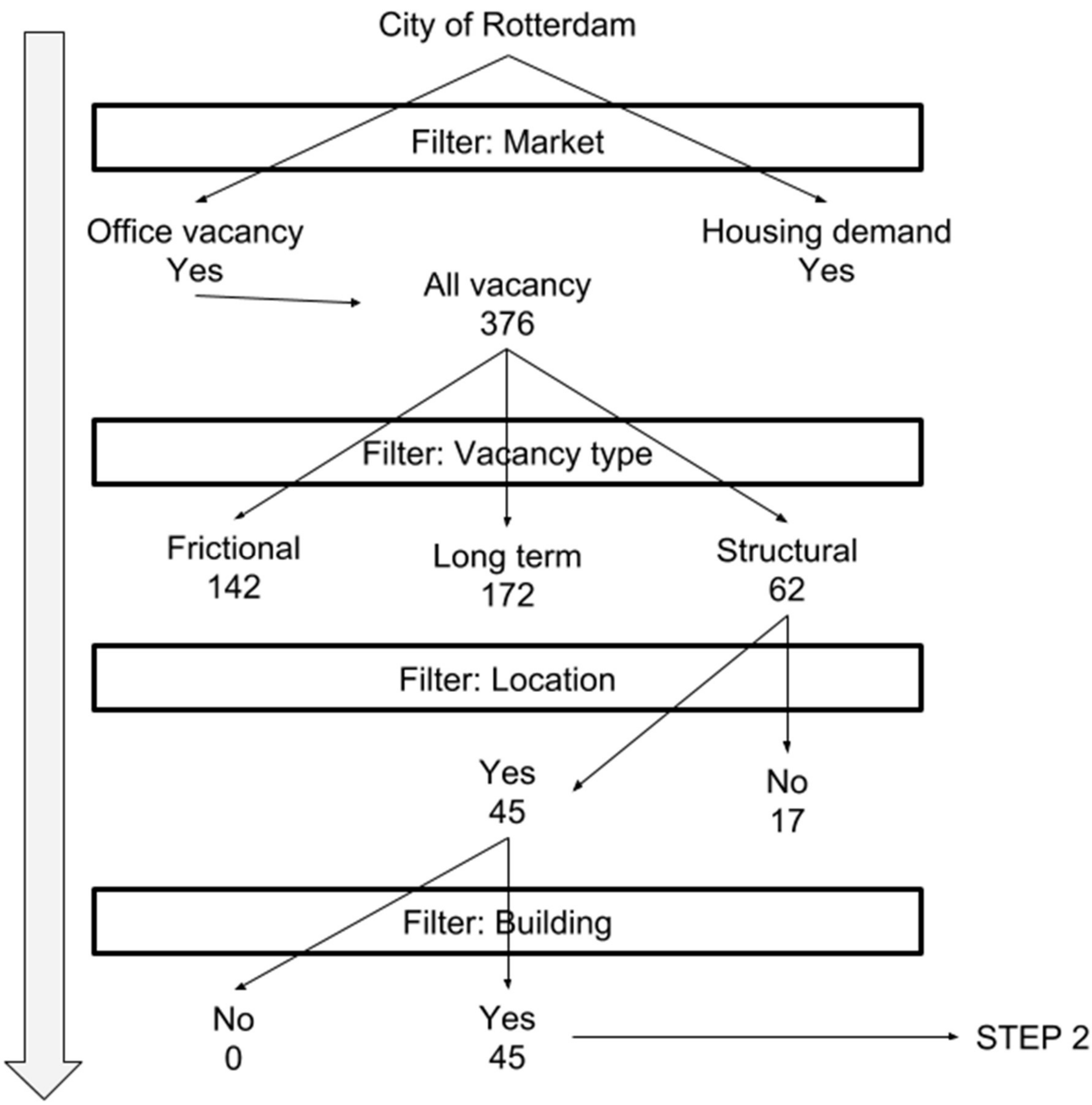


Figure 26, visualization of step 1assessment using veto criteria Conversion Meter Rotterdam 2018

Step 2. Gradual Location Appraisal

Of the 376 vacant office buildings located in Rotterdam only 45 passed all of the veto criteria of step 1. These 45 structural vacant offices now proceed to step 2: further appraisal of the location using gradual grading criteria. To amplify the importance of the location an extra Go / No Go decision is added to the original Conversion Meter 2016. There are 23 locational gradual criteria divided over 6 aspects as shown below in table 14. Of those 23 criteria at least 15 or two thirds must be assessed as yes, receiving a score of 1. With this minimum requirement, more weight is put on the locational aspects. This extra weighing is additional to the weighing already built in, in the original meter. Here the locational score is multiplied by 5 in comparison to a factor 3 for building gradual criteria. Reason of the location being of more importance is as follows: a good building on a bad location will most likely result in an unsuccessful project. However, a bad building on a good location can be a successful project. This is because the building can be changed, in this case transformed, the location cannot or to a lesser extent. Real estate is therefore location, location, location.

Each of the 45 remaining structural vacant office buildings are assessed on the 23 location gradual criteria. The table below gives a summary of this grading process. The complete overview can be found in appendix 4.

Step 2 Further Appraisal Further appraisal of vacant office building location			
Answer yes (score=1) is positive for conversion into homes. Answer No (score=0) is negative for conversion into homes. A score of at least 15 out of 23 must be obtained in order to proceed to the gradual assessment of the building.			
Aspect	**Veto Criterion**	**Assessment**	
	Functional	Yes	No
1. Urban location	1. Building in suitable area (not peripheral)	38	7
	2. Good natural light possibilities	42	3
	3. Good view from building > 75% floor space	33	12
2. Distance and quality of amenities	4. Shop for daily necessities < 500m	37	8
	5. Neighborhood meeting places (square, park) <500m	43	2
	6. Food service industry (bar, café, restaurant) < 500m	41	4
	8. Basic medical facilities (GP, health center) < 2km	40	5
	9. Sports facilities (fitness, swimming pool, sports park) < 2km	44	1
	10. Educational facilities (from kindergarten to high school) < 2km	44	1
	11. Educational facilities higher education <2km	44	1
3. Accessibility by public transport	12. Distance to railway station < 2km	16	29
	13. Distance to bus-, tram-, metro stop < 500m	45	0
4. Accessibility by car	14. Good flow, normal street quality	45	0
	15. Distance to parking sites < 250m	45	0
	16. > 1 parking lot / 100SQM office space	8	37
	Cultural		
5. representative impression	17. Situated centrally (not near highway locations)	37	8
	18. Other buildings present in direct neighborhood	44	1
	19. Lively neighborhood	31	14
	20. Direct availability of green environment	42	3
	21. Area has a good reputation/image (no vandalism/low crime)	7	38
	22. Area has good air quality and low pollution and noise hindrance	45	0
	Legal		
6. Urban location	23. Noise load on façade < 50dB (e.g. max for office building is 60dB)	39	6
	Result Further Appraisal		

Table 15, Step 2 Gradual Location criteria Conversion Meter Rotterdam 2018

38 of the 45 had 15 or more yes assessments for the gradual locational. The seven structural vacant office buildings that failed the locational grading are:

- Brielselaan 85
- Coolhaven 236-238
- Lichtenauerlaan 122-140
- Lichtenauerlaan 222-240
- Max Euwelaan 21-29
- Max Euwelaan 55-57
- Sluisjesdijk 37

These seven structural vacant buildings will be excluded from further measuring their transformation potential. What is noticeable, that only 7 of the remaining 45 are located in peripheral areas. These areas are office / industrial parks. The other 38 are located in mixed use areas with some or all of the facilities as stated in the other gradual criteria. The distance to these facilities was measured using Google Maps. A downside to these urbanized areas is parking. This also shows in the assessment of criteria 15. Only 8 structural vacant office buildings pass this criterion with a “yes”. Most of these “yesses” are the objects located in the peripheral areas. The connectivity was also measured with distance to public transport. A low score was reached for distance to train station, only 16 out of 45. This is however compensated with the other ways of public transport. All objects are located within 500 meters of a bus-, tram-, or subway stop. The other criterion that has a low yes-assessment rate is criterion 20, area has a good reputation/image (no vandalism/low crime). The municipality has made a physical-, safety- and social scan for each district and neighborhood. From these scans it showed that the districts Charlois and Centrum performed poorly on the safety index. This resulted in the low score, since most of the vacant buildings are located here.

After assessing the location of each structural vacant office building that passed the quick scan, it can be concluded that the hypothesis “According to experts an advantage of the Rotterdam office market is that more than half of its vacancy (read: structural vacancy) is either in or close to the city center and therefore suitable for transformation (Nederpelt, 2015)” is hereby confirmed. Of the 62 structural vacant buildings 38, or 61%, has a suitable location for transformation. These remaining 38 structural vacant office buildings proceed to step 3, further assessment of building using gradual criteria.

Step 3. Gradual Building Appraisal

Only 38 structural vacant office buildings remain to be tested in step 3. Here these remaining buildings will be appraised using gradual building criteria. As previously mentioned in chapter 3 there are 28 gradual criteria divided over 14 aspects or groups. The table below gives an overview of the results from step 3.

Step 3 Further Appraisal Further appraisal of vacant office building			
Answer yes (score=1) is positive for conversion into homes. Answer No (score=0) is negative for conversion into homes			
Aspect	**Veto Criterion**	**Assessment**	
	Functional	Yes	No
1. year of construction or renovation	1. Building > 3 years	38	0
	2. Building renovated > 3 years	0	38
2. Vacancy	3. Complete building is vacant	8	30
3. New housing	4. Capacity building > 20 1p-units / 50SQM	29	9
	5. Lay outs adaptable for local target groups	38	0
4. Extendibility	6. Horizontal extension building possible (neighboring buildings)	6	32
	7. Vertical extension building possible (no inclined roof / light support structure)	18	20
	8. Possibilities for constructing basement	0	38
	Cultural		
5. representative impression	9. Identifiable compared to surrounding buildings	37	1
	10. Own identity realizable	38	0
6. Cultural image	11. Being not a cultural heritage	30	8
7. Access (entrance, elevators, stairs)	12. Clear, safe and clarifying building entrance	33	5
	Technical		
8. Condition of maintenance	13. Well maintained; maintenance up to date	24	14
9. Dimensions of support structure	14. Depth of building < 10.00m	38	0
	15. Grid support structure > 3.60m	38	0
	16. Height dimension between floors < 6.00m	37	1
10. Support structure (walls, columns, floors)	17. Condition support structure is good / not hazardous	38	0
	18. Possible connection inner walls on grid < 5.40 m	37	1
11. Façade	19. Façade / openings well adaptable	8	30
	20. Façade windows can be reused / opened	16	22
12. Installations	21. Sufficient service ducts can be constructed	37	1
	Legal		
13. Environment	22. Absence of large amount of hazardous materials in building	2	36
	23. Acoustic insulation of floors > 5dB	27	11
	24. Good thermal insulation of facades and roof	15	23
	25. Sufficient daylight factor > 90% floor surface new units	30	8
14. National building decree	26. Elevators available / easy realizable in building (> 4 floors)	34	4
	27. (Emergency) stairways available / realizable	38	0
	28. Distance of new units to stairs / elevators < 50m	38	0
	Result Further Appraisal		

Table 16, Step 3 Gradual Building Criteria Conversion Meter Rotterdam 2018

What is noticeable that only 8 buildings where completely vacant. The remaining 30, or actually all other structural vacant offices were only partly vacant. All of the buildings are older than 3 years. The "youngest" building of these remaining 38 dates back to 2002. As shown in the table below there is no clear building era among the remaining structural vacant buildings

From	To	All structural vacancy	Step 3
pre 1900		4	3
1900	1909	1	1
1910	1919	1	1
1920	1929	1	1
1930	1939	2	2
1940	1949	4	2
1950	1959	10	7
1960	1969	3	3
1970	1979	9	6
1980	1989	8	6
1990	1999	16	6
2000	2009	4	1
2010	2019	0	0
	Total	62	38

Table 17, Year of construction in relation to transformation potential

From the on-site inspections none of the buildings looked as if it had been renovated recently. Only 6 buildings may be horizontally extended due to extra space on its plot according to the Cadastre. Criterion seven was graded using on sight inspections and the zoning plan. 20 of the 38 may not be expanded vertically, either because of an inclined roof or light (read: wooden) or that the zoning plan does not permit an additional floor or more height. Most technical aspects can also be assessed with a yes. However, the adaptability of the façades only for 8 out of 38. Reason being that the façade is a structural element for these buildings. Therefore, these façades are not easily changed.

Since 1998 it is forbidden to use the hazardous insulation material asbestos. Since 36 out of the 38 structural vacant office buildings predates 1998, the assumption of the presence of asbestos in these buildings is made. The energy labels are used for criteria 24, thermal insulation. All buildings with a lower label than C received a "No" score. The other legal criteria were mostly assessed with on-site inspections.

Step 4. Transformation potential Score

As previously mentioned and shown in the table below each structurally vacant building that completes the first 3 steps of the Conversion Meter Rotterdam 2018 will receive a transformation score, here in step 4. This score translates into a transformation potential classification as shown in the table below. As explained in chapter 3, the locational score is multiplied by 5 and the building score by factor 3.

Conversion score	**Conversion class**
Conversion score location + building = 0 - 40	Class 1: No transformation potential
Conversion score location + building = 41 - 80	Class 2: Hardly any transformation potential
Conversion score location + building = 81 - 120	Class 3: Limited transformation potential
Conversion score location + building = 121 - 160	Class 4: High transformation potential
Conversion score location + building = 161 - 194	Class 5: Excellent transformation potential
Maximum score location+ building = 110 + 84 = (22*5) + (28*3) =	194
Total score feasibility scan = A (location) + B (building) =	Score Transformation Potential

Table 18, Step 4 Transformation classification Conversion Meter Rotterdam 2018

Of the 62 structurally vacant office buildings 38 completed all three steps. These remaining buildings all received a score of at least 122. Meaning that all have a high or excellent transformation potential. To be exact, 6 buildings are class 5 and 32 class 4. The remaining 24 structural vacant buildings received a score of 0 and are therefore class 1, no transformation potential. Even though the latter group may have had a high building grade, the location grade and / or veto criteria were not good enough. Appendix 5 gives an overview of the classification of all structural vacant office buildings. The map below shows the location and the transformation classification of the 62 structural vacant office buildings according to the color classification from table 17.

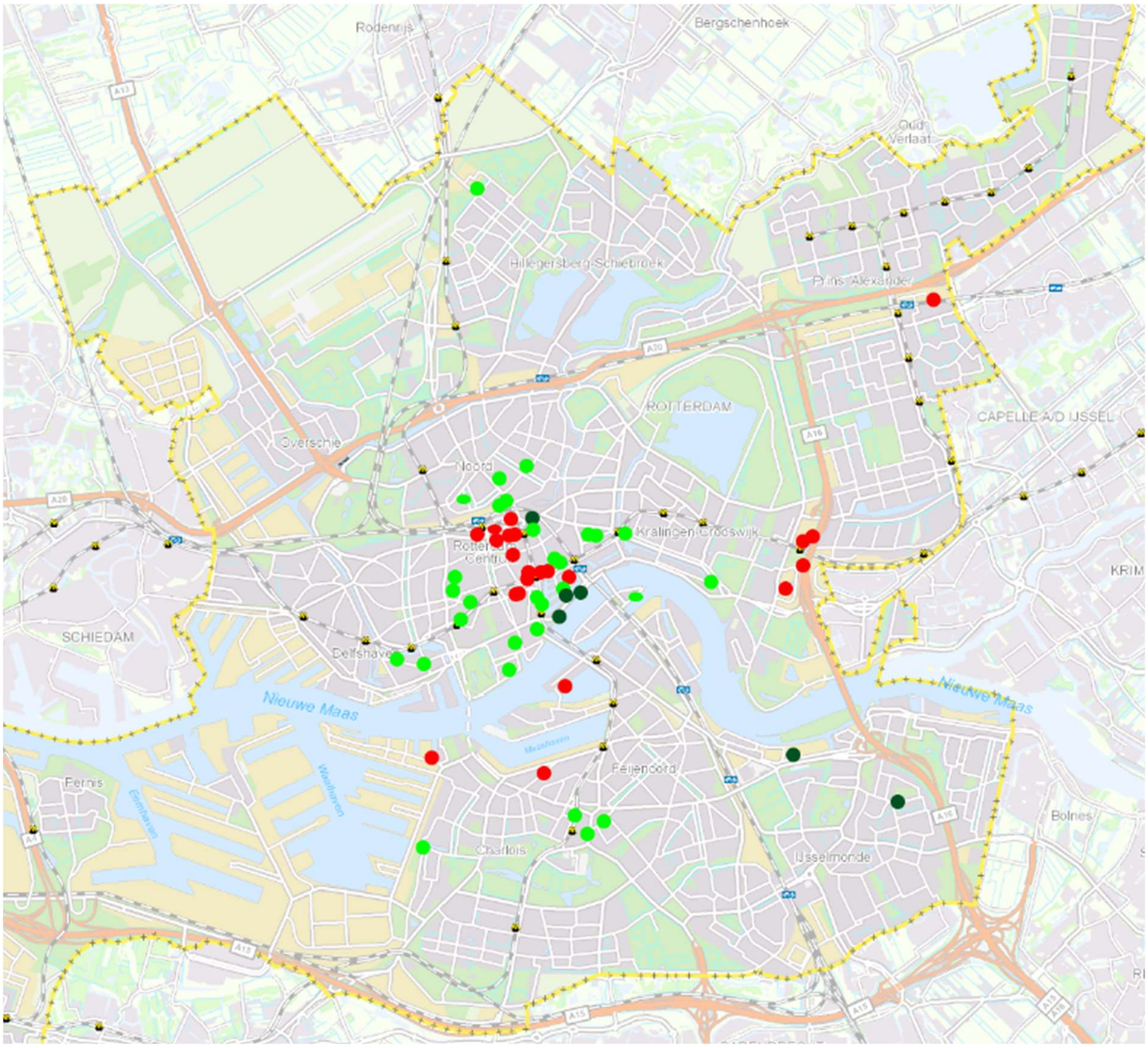


Figure 27, GIS MAP Transformation potential per object (source: Own illustration)

Step 5. Financial Appraisal

The transformation potential has been measured qualitatively for the structural vacant offices. This part will quantitatively measure the transformation potential of the high and excellent potentials. The quantitatively analysis will be done by making a first costs and benefits analysis. The input for this costs-benefits analysis comes from market data and the key figures from the original Conversion Meter 2017. The key figure from CM17 are cost related as shown below in table 18. With these numbers an educated estimate can be made of the acquisition and building costs.

Costs	Low level of interventions		High level of interventions	
	Construction costs	Purchase costs	Construction costs	Purchase costs
Student room	460 - 620	230 - 310	550 - 740	140 - 190
Studio	620 - 930	310 - 460	740 - 1110	190 - 270
2/3-room apartment, young couples	770 - 1030	380 - 520	**930 - 1230**	**190 - 260**
4-room apartment, young couples	770 - 1150	380 - 570	930 - 1380	270 - 400
3-room apartment, senior citizens	370 - 560	180 - 270	450 - 660	110 - 170
4/5-room apartment, senior citizens	500 - 1150	250 - 570	600 - 1380	140 - 340

Table 19, Transformation costs key figures (Source: Conversion Meter 2017)

The market data gives input for the revenue side of the calculation. These are the most common housing types for each neighborhood together with their average size and SQM price. Also, the total floor space of each building is needed to be able to calculate how many residential units may be accommodated. To accommodate the residential units in office buildings extra inner walls, stair cases and elevators etc. must be implemented. For this a gross floor area – lettable floor area ratio is needed. This number varies and is different for each project. However, an average GFA – LFA ratio figure will give a clear first indication. After this, drawings need to be made to calculate precisely how many dwellings can be built. A form factor of 1.3 for the GFA-LFA ratio is set to accommodate the extra facilities/installations needed in residential buildings such as inner walls, extra access points (elevators and stairs) and extra plumbing. How these calculations are made are described in chapter 3, methodology. The output of the calculations is shown here. For each building a so called building passport has been made. All building passports along with the entire spreadsheet with all data and calculations can be found in appendix 6 and appendix 7.

If all 62 structural vacant offices would be transformed into residential units using the average size of the most common housing type of the specific neighborhood this office building is located in, then 4.774 residential units could potentially be added to the Rotterdam stock with a potential profit of 661.071.995 Euro. However, since 24 of these 62 buildings have no transformation potential, the potential residential units from these buildings will be excluded. The 38 remaining office buildings may be transformed into 1.706 residential units.

The building passports of the six excellent transformation potentials are shown below. What is noticeable, is that Groene Tuin 277-299 will make a loss according to this financial analysis. This goes to show, even though from the veto and gradual criteria it should have excellent transformation potential, that after the financial assessment this is not the case.

Groene Tuin 277-299; 3078KG	Building properties	Transformation potential
	Neighborhood ▪ Groot Ijsselmonde Noord Total Floor area ▪ 3.228m² Vacancy ▪ 2.343m² – 72,58% Office rent ▪ €unknown Residential sell price ▪ €1.918 Year of construction ▪ 1992	Score ▪ 162 ▪ Class: 5 Financials Units: ▪ 27 units Construction & Acquisition cost: ▪ €4.809.720 Revenue: ▪ €4.762.541 Potential Profit: **-€200.766,-**

This financial infeasibility is also occurring at 4 high transformation potentials.

- Schulpweg 37
- Strevelsweg 700
- Twentestraat 50-60
- Zuidplein 2-18

The infeasibility is caused by the high acquisition costs. However, the acquisition costs are estimated using key figures. These give a good estimate but this is not the exact price of the building.

Schulpweg 37; 3084NG	Building properties	Transformation potential
	Neighborhood ▪ Oud Charlois Total Floor area ▪ 6.129m² Vacancy ▪ 3.400m² – 55,47% Office rent ▪ €unknown Residential sell price ▪ €1.757 Year of construction ▪ 1970	Score ▪ 143 ▪ Class: 4 Financials Units: ▪ 54 units Construction & Acquisition cost: ▪ €9.132.210 Revenue: ▪ €8.283.579 Potential Profit: **-€972.702,-**

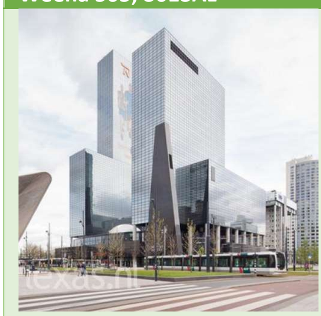
Strevelsweg 700; 3083AS	Building properties	Transformation potential
	Neighborhood ▪ Vreewijk Total Floor area ▪ 18.600m² Vacancy ▪ 350m² – 1,88% Office rent ▪ €unknown Residential sell price ▪ €1.778 Year of construction ▪ 1960	Score ▪ 144 ▪ Class: 4 Financials Units: ▪ 149 units Construction & Acquisition cost: ▪ €27.714.000 Revenue: ▪ €25.439.076 Potential Profit: **-€2.281.488,-**

Twentestraat 50-60; 3083BD	Building properties	Transformation potential
	Neighborhood ▪ Zuidplein Total Floor area ▪ 2.500m² Vacancy ▪ 2.231m² – 89,24% Office rent ▪ €120 Residential sell price ▪ €1.851 Year of construction ▪ 1990	Score ▪ 159 ▪ Class: 4 Financials Units: ▪ 23 units Construction & Acquisition cost: ▪ €3.725.000 Revenue: ▪ €3.559.615 Potential Profit: **-€276.587,-**

Zuidplein 2-18; 3083CW	Building properties	Transformation potential
	Neighborhood ▪ Zuidplein Total Floor area ▪ 3.500m² Vacancy ▪ 2.158m² – 61,66% Office rent ▪ €125 Residential sell price ▪ €1.851 Year of construction ▪ 1990	Score ▪ 154 ▪ Class: 4 Financials Units: ▪ 33 units Construction & Acquisition cost: ▪ €5.215.000 Revenue: ▪ €4.983.461 Potential Profit: **-€267.277,-**

The negative financial result is related to the low average price per sqm. All of these structural vacant office buildings are located in neighborhoods where housing prices are on the low end of the spectrum. This shows that the closer to the city center of Rotterdam an office building is, the more profitable this project probably is. This may also explain why these buildings remain vacant. The Strevelsweg 700 is also the building with the worst financial result.

Calculations have been made for all 62 structural vacant objects. Only 7 (including the aforementioned 4) had a negative financial result. The best financial results are made at buildings located in the Centrum district or other designated office areas. But, as mentioned before a change in zoning plan is most likely to be denied. The building with the highest financial result is Weena 505. This office building is located in the designated office area.

Weena 505; 3013AL	Building properties	Transformation potential
	Neighborhood ▪ Cool Total Floor area ▪ 65.685m² Vacancy ▪ 27.507m² – 41,88% Office rent ▪ €190 Residential sell price ▪ €3.532 Year of construction ▪ 1992	Score ▪ 0 ▪ Class: 1 Financials Units: ▪ 520 units Construction & Acquisition cost: ▪ €97.870.650 Revenue: ▪ €178.461.092 Potential Profit: **€80.283.430**

These buildings will most likely be reoccupied when the office space is renovated and upgraded. That these projects will become successful because the location is good AND the building is good again. There are buildings that received an excellent qualification and a positive financial result. The building with the highest transformation potential score and best financial result is Boompjes 40. This result is again due the high selling price per square meter.

Boompjes 40; 3011XB	Building properties	Transformation potential
	Neighborhood ▪ Stadsdriehoek Total Floor area ▪ 40.585m^2 Vacancy ▪ 14.730m^2 – 36,29% Office rent ▪ €unknown Residential sell price ▪ €3.576 Year of construction ▪ 1988	Score ▪ 164 ▪ Class: 5 Financials Units: ▪ 346 units Construction & Acquisition cost: ▪ €60.471.650 Revenue: ▪ €111.639.969 Potential Profit: **€50.884.990**

4.4 Empirical results

In the 10 selected districts of Rotterdam there were 314 office buildings that where coping with vacancy. Of these 314 buildings 142 were recorded as frictional vacant, 172 long term and 62 as structurally vacant. This latter group was selected to further analyze for its transformation potential. The reason the other buildings are discarded is because the function of office is not completely redundant here, as it is in structural vacant office buildings.

Of these 62 structurally vacant office buildings only 8 were completely vacant. The other 30 still had 1 or more occupants or tenants. After step 1, quick scan using veto criteria 17 more buildings were discarded for further testing. These 17 buildings are located in designated office areas by the municipality of Rotterdam. Here it is not likely to be allowed to have the zoning plan changed to residential use. However, if this was the case these buildings would have received the highest transformation classification mainly due to their location and partly because of the building characteristics. Step 2 involved the further grading the location using 23 gradual criteria. In order to proceed to the next step at least 15 out of these 23 criteria should receive a “yes” assessment. 7 out of the remaining 45 structural vacant office buildings after step 1 failed to comply to this minimum requirement. Because these buildings only reached a score of 14 or less. Only 38 out of the 62 structural vacant office buildings reached step 3. In this step the building characteristics where graded using 28 gradual criteria. Because after step 3 there is no GO / NO GO decision built in.

But, such a decision is however built in, in step 4. With calculating the transformation class, 6 buildings were discarded. This was caused by a low locational score. This score was high enough to pass step 2 but too low to pass step 4. All of these buildings are located in the business park Brain Park. After the qualitative measuring using veto and gradual criteria, 6 buildings received an excellent transformation potential classification, 32 high potential and the remaining 24 have no potential according to the Conversion Meter Rotterdam 2018. This latter group will be discarded from further testing. The excellent and high potentials moved to the financial feasibility scan. Here a first costs-benefit analysis is made using key figures and market data. The key figures are used to determine acquisition and construction costs. The market data are used to determine potential revenue with the use of most common housing type and their average size and square meter price. This financial scan resulted in 5 more buildings to potentially be unfeasible as a transformation project. So ultimately out of the 62 office structural vacant office buildings 33 have excellent or high transformation potential according to the Conversion Meter Rotterdam 2018 qualitative and quantitative tests.

At the start of this chapter three hypothesis and theoretical outcomes were given. Now that the testing of all structural vacant offices is completed, empirical results can be given to these hypotheses. The first hypothesis was related to the location of the structural vacant offices. As shown on the map of figure 20 more than half of the structural vacant office are in fact located in or close to the city center of Rotterdam.

Apart from half the office space being located near the city center there are more aspects for transformations to be successful. With considering these other aspects it is said that 50% is suitable for transformation. Looking at number of structural vacant buildings in Rotterdam, 33 out of 62, this is confirmed by the empirical outcome. However, if this is calculated using floor space, the 50% is not reached. The total floor space of all structural vacant offices combined is 619.621m^2. The floor space that is suitable for transformation after quantitatively and qualitatively testing amounts 218.091m^2. This is 35.2%. This is caused by the large office buildings located in the office district. These buildings are located in designated office areas and are therefore to remain offices.

If all 62 structural vacant office would be transformed into residential units using the average size of the most common housing type of the specific neighborhood this office building is located in, then 4.774 residential units could potentially be added to the Rotterdam stock. However, since 24 of these 62 buildings have no transformation potential, the potential residential units from these buildings will be excluded. The 38 remaining office buildings may be transformed into 1.706 residential units. Of the 50.000 residential units needed, these 1.706 are only 3.4%.

From using the Conversion Meter Rotterdam 2018 it became evident, that the principle of the original and the adapted meter of a step by step analysis from global to detailed, it is a good method to determine a city's transformation potential towards housing.

4.3 Evaluation of results by TransVORM

As stated in chapter 3 the empirical part of the research will be concluded with an expert panel evaluation of the tool and the results. The tool and the results were shown to real estate developers at VORM. VORM is a real estate development firm in the Netherlands that operates mainly in the Randstad area. This company also has a department specialized in transformation projects called TransVORM. Two professionals from this department, Christiaan Groeneweg and Harold Clabbers, were asked to evaluate the Conversion Meter Rotterdam 2018 and the results of testing Rotterdam's office vacancy towards housing. For this meeting the Conversion Meter Rotterdam 2018 was presented. Each veto and gradual criterion were explained on what it was, why it is a veto or gradual criterion and how the data needed to test an office building was collected. Then the output was shown, the "building passports" along with the entire database with all vacant office buildings and their locational and building characteristics.

The two developers confirmed the importance of the location in transformation projects. This is of more importance than the building they said. However, the building itself is also important. It adds character and cultural value and may be used as a marketing tool to help sell the houses. But location first and then building. They therefore agreed with separating the gradual grading of location and building into separate steps. The most remarkable comment on the content of the tool was about location gradual criteria 1. Building in suitable area (not peripheral). This criterion should be a gradual criterion when the entire area will be redeveloped. It becomes a veto criterion when just one specific building is redeveloped in this peripheral area. All criteria, veto and gradual, were basically in line with the criteria that they use. However, not in this systematic step by step approach. They are currently setting up a database / tool in which all vacant buildings in the Randstad area are collected and mapped along with building and locational information together with JLL. Because of their own project with JLL, both developers were very interested in the list of which criteria were used in the tool and the list of selected vacant office buildings. The way the output is presented in the small table with key figures i.e. building passports will most likely be similar in their tool, they said. Apart from the "Building in suitable area" being a veto criterion, also the size of the building is a veto criterion according to the them. They only select objects that have at least 5.000 square meter of floor space. This does not apply for all developers. Of course, there are developers that do smaller buildings then 5.000m². For another developer specialized in small scale transformation projects the outcome may be different and could set a veto criterion for maximum size of 5.000m². The last remark they had, was related to the stakeholder veto criteria from the original conversion meter. How they usually approach a project is: first they make a feasibility quick scan of their own regardless of who the owner is. Cold acquisition they call this. When the project is feasible after this quick scan, they approach the building owner. This is in line with my own observation and the dismissal of the stakeholder related veto criteria. Yes, stakeholders affect the project, but they do not affect the transformation potential. With the results from the adapted Conversion Meter you can go the stakeholders and convince them to join the project team. Both experts agreed to this statement, since it is difficult if not impossible to locate the building owners of all the tested structural vacant offices in Rotterdam.

The changes suggested by the experts are one locational aspect and one building aspect. To summarize these are:

- Peripheral location is a veto criterion
- Minimum floor space 5.000m² also a veto criterion

The Conversion Meter Rotterdam 2018 (CMR18) was updated using the input of the experts creating the Conversion Meter Rotterdam 2018 Expert or CMR28E. With the two added veto criteria the entire

Rotterdam portfolio of vacant office space was assessed for their transformation potential. The results of this second assessment of the entire portfolio using the CMR18E shows that only 13 buildings will pass the new veto criteria. This is mainly due to veto criterion "minimum floor space 5.000m²". The criterion "located not in peripheral area" gave a similar result in both versions. The only difference here is that buildings located in peripheral areas are filtered out in Step 2 of the CMR18 compared to being filtered out in Step 1 of the CMR18E. SO, if the "size" criterion is discarded, then no difference is noticeable in the results between both versions of the tool. The list below shows the 13 buildings that have transformation potential according to tool evaluated by the experts. Two out of the remaining 13 have excellent potential. The other 11 were assess as having high transformation potential.

Location	**Potential**	**Residential Units**
Boompjes 40	Exellent Potential	346
Boompjes 250	High Potential	76
Glashaven 16-70	High Potential	52
Goudsesingel 66-202	High Potential	191
Hofplein 20	Exellent Potential	156
Noordsingel 113-117	High Potential	52
Oostmaaslaan 59-71	High Potential	113
Prins Hendrikkade 12-16	High Potential	34
Rochussenstraat 125	High Potential	22
Schiedamse Vest 154	High Potential	20
Schiekade 101	High Potential	19
Schulpweg 37	High Potential	54
Strevelsweg 700	High Potential	149
Vasteland 10-40	High Potential	69 +
		1.353

Out of the 62 structural vacant office buildings 38 buildings have transformation potential offering the possibility to create 1.704 residential units when using the CMR18. When using the CMR18E, 13 buildings have transformation potential offering the possibility to create 1.353 residential units. This is related to many of the structural vacant office buildings in Rotterdam being smaller then 5.000m² and can therefore only accommodate so many residential units. So approximately one third of the buildings can accommodate two third of the residential units. What can be concluded from this outcome is the flexibility of the tool. The tool can be easily adapted to specific demands of a certain user keeping the main structure, the step-by-step approach intact.

5. Conclusion

Current transformation tools can be used to measure Rotterdam's transformation potential by use of market, location and building characteristics. The tool that has proven to be best suited to assess Rotterdam structural office vacancy for its transformation potential towards housing is an adapted version of the Conversion Meter 2017 from Geraerdts et. al (2017), the Conversion Meter Rotterdam 2018. This tool made it possible to assign a score to the market, location and building characteristics. The transformation potential could then be ranked and given a classification. With the use of this tool also a first financial feasibility study can be made. Of the selected target group, all 62 structural vacant offices, 38 could potentially be transformed successfully into housing. Six buildings received a classification of excellent transformation potential, 32 are considered to have high transformation potential and 24 have no transformation potential.

These high and excellent potentials are located in or close to the city center as experts had already claimed. However, 17 of the "no potentials" were located in the city center. This favorable location for transformation has been made unfavorable by municipal policy. These 17 centrally located offices are in the middle of designated office areas. Upgrading of this office space is a better solution for this structural vacancy, because a change in zoning plan is most likely to be denied. Apart from half the office space being located near the city center there are more aspects for transformations to be successful. With considering these other aspects it is said that 50% is suitable for transformation. Looking at number of structural vacant buildings in Rotterdam, 33 out of 62, this is confirmed by the empirical outcome. However, if this is calculated using floor space, the 50% is not reached. The total floor space of all structural vacant offices combined amounts to 619.621m^2. The floor space that is suitable for transformation after quantitatively and qualitatively testing amounts 218.091m^2. This is 35.2%. This is caused by the large office buildings located in the office district. These buildings are located in designated office areas and are therefore to remain offices. If all 62 structural vacant office would be transformed into residential units, using the average size of the most common housing type of the specific neighborhood the office building is located in, then potentially 4.774 residential units may be added to the Rotterdam stock. However, since 24 of these 62 buildings have no transformation potential, the potential residential units from these buildings will be excluded. Only the 38 remaining office buildings can, according to the Conversion Meter Rotterdam 2018, be transformed into 1.700 residential units. Of the 50.000 needed these 1.700 is only 3.4% of the total needed residential units.

Looking at the results and the used method of the tool it became evident that the principle of the Conversion Meter Rotterdam 2018 of a step by step analysis from global to detailed is a good method to determine a city's transformation potential towards housing. This step by step approach, the inclusion of all three main influencing factors related to transformation (market, location and building) and the speed in which an assessment could be made, outperformed the other two selected tools. These were the ABT Quick Scan and the Herbestemmingswijzer. Apart from these three previously mentioned aspects the Conversion Meter was more suitable for this research because of two more reasons. The ABT Quick Scan hardly considers the market and locational factors related to transformation. These aspects are more critical to the success of a transformation project that the building itself. According to findings in the theoretical framework, the locational characteristics have been proven to be more superior to the building characteristics related to affecting the success or failure of transformation projects. No matter how great the building is, if the location is not right the project can hardly become successful. The inverse of this hypothesis or a great location and bad building is more likely to become a successful project. However, the type of intervention in this latter statement may vary. Related to Rotterdam the municipality aims to densify the inner city. A good location here is also considered to be in or around the city center. However, if the structurally vacant building is small i.e. few residential units can be realized, then demolition and new build may be a better option. Apart from the locational and market aspects not being sufficient in the ABT Quick Scan, the usability also lacked. In the time 2 buildings could be appraised using the Conversion Meter Rotterdam 2018 not 1 full appraisal could be made using either the ABT Quick Scan or the Herbestemmingswijzer. Also, both scans require some sort of expertise (read input) from the consultancy companies responsible for making these tools. Respectively ABT and PRC consultants.

Even though the Conversion Meter 2017 is the most suitable tool for measuring Rotterdam's transformation potential towards housing, there were flaws. Because of these flaws, adaptations had to be made to the original version to better suit Rotterdam's situation. This created the Conversion Meter Rotterdam 2018. The adaptations were more content related. This adapted version of the Conversion Meter 2017 remained the same in its structure. A step by step approach from broad to detailed, the number of steps, the Go / No Go decisions and some grading criteria where added, changed and or removed entirely.

Two major changes were made to the original version. The first change affected step 1. In the original Conversion Meter 2017, 8 aspects are identified with a total of 10 veto criterion. Six of these ten are stakeholder related criterion. In the new version the stakeholders are eliminated as a veto criterion. Reason of this removal is that for this research stakeholders. The assumption was been made that all stakeholders are able / willing to cooperate. Stakeholders are in fact important to a project being executed but they do not affect the financial and technical feasibility of a transformation project. Other more willing stakeholders can always be found. The building and its location are immoveable. The latter two are therefore incorporated in the first step of the adapted Conversion Meter, together with market related veto criteria. The second major change to the original meter affected step 2. In the original tool location and building are gradually graded in the same step. Since research has shown that the location is of more importance to the success of a transformation project, the locational and building aspects are graded separately in the adapted version. First the location is graded using gradual criteria. After this the building is graded. Before the grading of the building can commence, the object must have reached a minimum score in the grading of the location. If this score was not met it would not proceed to the next step, gradually grading the building characteristics.

The input needed to assess these markets, location and building characteristics all came from publicly available sources. The combination of these sources resulted in a database of all vacant office buildings in the 10 selected districts of Rotterdam. For all these buildings and districts locational and building characteristics were listed. Locational characteristics such as distance to facilities, connectivity by car and public transport, most common housing type, average size and price for these housing types, etc. Building characteristics such as total floor area, floor to ceiling height, year of construction, etc. This information was then used for the veto and gradual criteria assessments. With just using desk research of putting together a database by consulting and cross referencing publicly available data, a clear image can be made of transformation potential using the Conversion Meter 2017 and adding "portfolio" specific factors to the original tool, a complete image of its transformation potential could be formed. This makes the original Conversion Meter 2017 a very usable tool for further use on other cities or portfolios. This is a good thing because even though the top end of the office market is showing signs of moving towards healthy vacancy levels of 4 to 6%. The bottom end of the office market, that is the number of structural vacant office buildings is increasing. With the use of this tool and easily adapting it to suit a specific situation, an educated first assessment can be made of its transformation potential as has been shown in this research.

In essence the Conversion Meter 2017 is a yes and no checklist combined with a first cost-benefit analysis. The set veto and gradual criteria used to assess the buildings come from years of tool development using scientific research. By going through all the steps, it lets the user think about all aspects that need to be considered when initiating a transformation project. The simplicity of the tool, which is the step by step approach from broad to detailed and the required input, is what gives it its strength. The relevance and usability of the research was evaluated and confirmed by experts. Experts selected to evaluate the adapted tool and its results were professional real estate developers specialized in transformation projects. The evaluation gave input the further adapt the Conversion Meter Rotterdam 2018. After this second adaptation of the tool, the entire Rotterdam office vacancy portfolio was put through all the steps again. After this second run only 13 buildings were classified as excellent (2) and high (11) potential. So different types of users weighing criteria differently may give different outcomes. However, the structure, the systematic step by step approach remains the same. This structure together with the used input and the building passports as output were considered to be very useful into assessing transformation potential. The content of each step can easily be altered to the demands of the user as was shown by the expert evaluation of the tool. To summarize this scientific research can be put to use in practice to combat the societal issue of office vacancy in the most sustainable way. By way of transformation.

Due to time constraints, not a full panel was used to evaluate the Conversion Meter 2018. Only the expertise of one real estate development firm was used. For further research it may be insightful to assess the tool using a variety of developers or initiators. This may offer different outcomes in the transformation potential of office buildings as was shown with the veto criterion of “minimum required size of 5.000m²”.

Also, further research on the spill-over effects of office vacancy might be interesting to uncover the “domino effect” of office vacancy if there is such a thing. This may be the case for Rotterdam due to its office vacancy being located in clusters. This also has to do with office locations being clustered. The spill over in vacancy therefore does not necessarily have to be between offices but can also be from office to other functions. In other words, area degradability.

6. Reflection

The approach for this research can be summarized in the following 6 steps:

1. Literature review on aspects related to transformation potential
2. Adapt existing tool according to findings in literature
3. Collect case studies and necessary empirical data
4. Run case studies through adapted tool
5. Evaluation of tool and results by real estate developers
6. Reflect on process

Now, almost at the end of the graduation process I can say that the approach worked but the time it took could have been considerably less. At the beginning of this research the main focus was to test the transformation potential of Rotterdam's office vacancy towards housing. The problems of oversupply in office space and the overheating housing market in the city sparked this idea. However, as the research progressed the focus shifted more towards the tools that could be used to assess the transformation potential than the transformation potential itself. This shift gave the research a more scientific approach. Meaning, that after more background information to the problems of office vacancy and housing shortage was given. A more in depth literature review was made on aspects that affect transformation projects, what tools exist and which of those tools capture these affecting aspects the best. Then a tool was selected according to certain selection criteria. This selected tool was then adapted according to findings in the literature review, creating an improved version. If this was in fact an improvement, was tested in the next part of the research, the empirical research. For this empirical part case studies were collected. For the selection of the case studies certain selection criteria were set up. Then the cases were put through the model essentially testing both the model for its usability and the case studies for their transformation potential towards housing. After completion of the case study testing the results and the tool itself were evaluated by two developers whose expertise is transformation projects. The above described process was not a straight line. The what and why was defined in early stages of the process. The "how" came as the research progressed. This was an iterative process. This process was assisted with the help of both mentors. Their feedback helped me mostly to get the words on paper. I had the ideas in my head but struggled with writing it down. With discussing the ideas and how I had done certain things, for instance the collecting of data, with them. They then guided me on how to structure this accordingly in the report. What may have given more input for the tool is a questionnaire amongst Rotterdam's office building owners, developers and municipality about the influencing factors and which of those factors are of more importance to the success of transformation projects. With this input, more criteria may have been added to the model. However, the experts did not give additional criteria to add to the model. Also, a multidisciplinary expert panel may have given extra insights to transformation related aspects from different viewpoints. This graduation research has given me a lot of insight on transformation projects. The qualitative and quantitative aspects. What affects these types of projects and how real estate developers deal with the challenges that come with these projects. Their empirical point of view. Also, the relation between theory and practice. Both findings in the literature and the empirical part helped make the original Conversion Meter a better tool to assess transformation potential

Research and design. In this thesis design did not consist of designing a building, but it consisted of the design of a tool to assess buildings. To assess vacant office buildings for their transformation potential towards housing. This is the design aspect in graduation at the department of Management in the Built Environment. To design and build this model, research was needed on aspects influencing transformation projects. The findings from theory formed the building blocks for this tool. This research is in line with and adds to the body of knowledge of the studio Adaptive Reuse of the department Management in the Built Environment. Setting up a theoretical framework as a foundation and implementing this into a tool and then empirically testing and evaluating this tool using case studies and two real estate developers specialized in transformation projects. The results of this research can be implemented in practice. Both the adapted tool and the outcomes of testing the case studies with the tool is meant with results here. This was confirmed by the experts. They were very interested in analyzing the database especially. Due to time constraints, not a full panel was used to evaluate the Conversion Meter 2018. Only the expertise of one real estate development firm was used. For further research it may be insightful to assess the tool using a variety of developers or initiators. This may offer different outcomes in the transformation potential of office buildings because other stakeholders may give a different weighing to certain criteria as was shown by the selected real estate developers. Next time I would have used a range of developers to perform a proper expert panel evaluation of the research results.

With this research better insight in the transformation possibilities has been given for the city of Rotterdam. This can be used to repurpose the existing stock in the most sustainable way possible. Apart from Rotterdam, the tool can be used to measure the transformation potential of all structurally vacant office space. To summarize this scientific research can be put to use in practice to combat the societal issue of office vacancy with all its negative effects on its surroundings in the most sustainable way. By way of transformation. However, outcomes may vary depending on the type of actor that uses the tool. Each user has the opportunity to alter the content of the steps. They can make a veto criterion a gradual criterion and vice versa. This is the strength of the Conversion Meter Rotterdam 2018. This flexibility can however also become a weakness. When alterations to the criteria are made randomly certain buildings that do have transformation potential may be left out. Or in a worst case scenario a building without transformation potential that may obtain a high transformation potential classification. Again, this is stakeholder / user specific. This is why the tool should only be used as a first good indicator / feasibility scan before any further (floor)plans and costs are made. The tool is essentially the first step towards initiating a transformation project.

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Appendix

Appendix 1. Inventory of Rotterdam's vacant office space

See next page.

District	Neighborhood	Postcode		Adress	sqm/for rent	Total LFA	% vacant	Months vacant	Rent price per m2/year	Year of construction	Energy Label	Floors	Building Height	Floor to ceiling height	Located in Office Zone	Located in Transformation Zone
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 20, inventory of office vacancy in Rotterdam part 1 of 3 sorted by district

Table 21, inventory of office vacancy in Rotterdam part 2 of 3 sorted by district

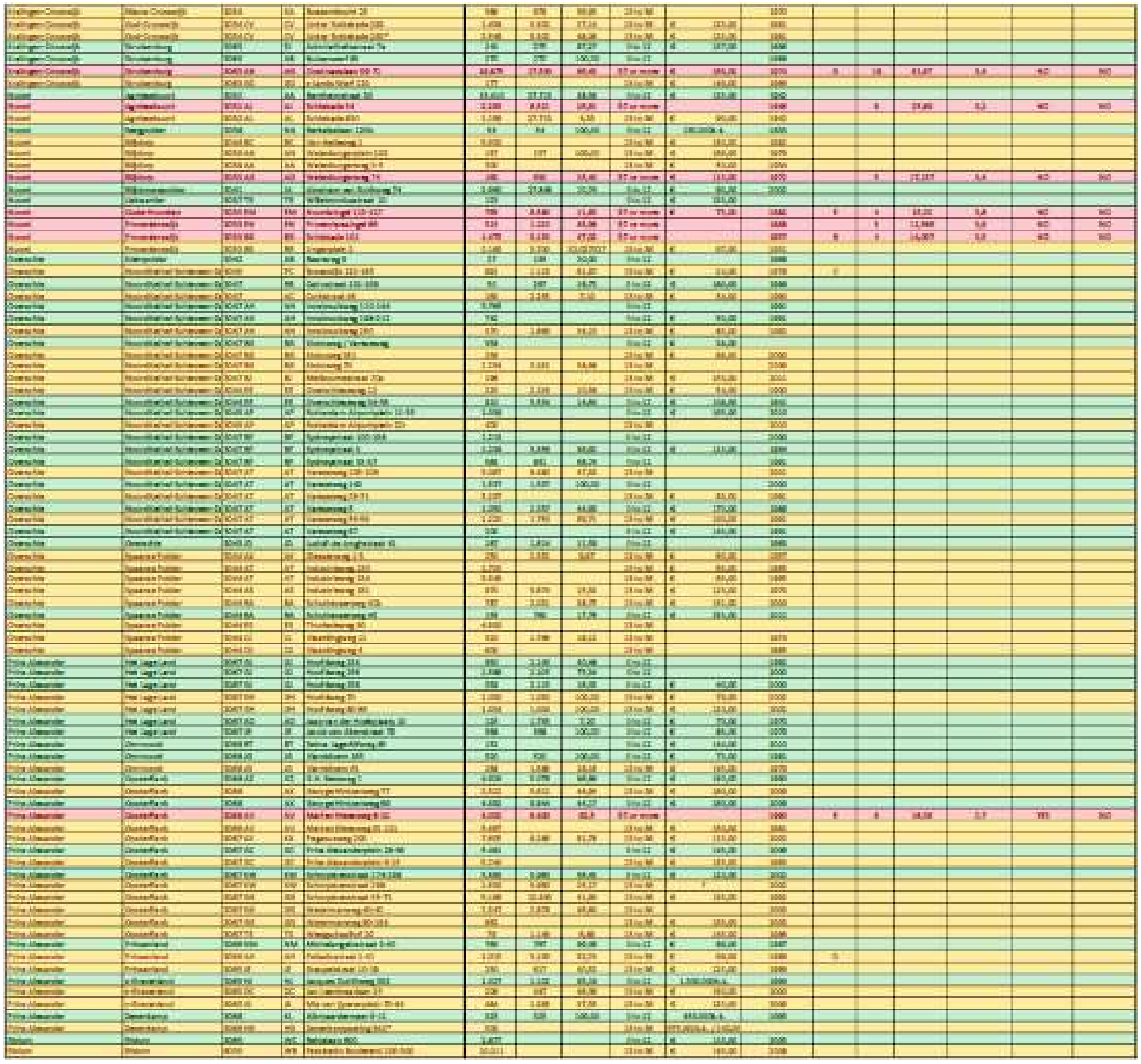


Table 22, inventory of office vacancy in Rotterdam part 3 of 3 sorted by district

Frictional vacancy	
Long term vacancy	
Structural vacancy	

District	Neighborhood	Postcode		Adress	sqm for rent	Total LFA	% vacant	Months vacant	Rent price per m2/year	Year of construction	Energy Label	Floors	Building Height	Floor to ceiling height	Located in Office Zone	Located in Transformation Zone
Centrum	Cool	3012	CA	Aert van Nesstraat 45	3.794	24.047	15,78	37 or more	€ 99,00	1976		11	58,823	5,3	YES	NO
Centrum	Stadsdriehoek	3011	TA	Blaak 20-40	7.116	15.870	44,84	37 or more		1978	G	5	34,353	6,9	YES	NO
Centrum	Stadsdriehoek	3011	GB	Blaak 555	17.219	32.056	53,72	37 or more		1996	B	23	104,947	4,6	YES	NO
Centrum	Stadsdriehoek	3011	XZ	Boompjes 250	3.960	9.000	44	37 or more	€ 150,00	1988	D	6	31,176	5,2	NO	NO
Centrum	Stadsdriehoek	3011	XB	Boompjes 40	14.730	40.585	36,29	37 or more		1988	D	24	90,129	3,8	NO	NO
Centrum	Stadsdriehoek	3011	XZ	Boompjes 545	1.560	1.560	100	37 or more		1988	A	22	71,51	3,3	NO	NO
Ijsselmonde	Oud-Ijsselmonde	3077	AW	Boterdiep 46-50	400	1.200	33,33	37 or more	€ 130,00	1986	B	3	14,503	4,8	NO	YES
Charlois	Tarwewijk	3081	AB	Brielselaan 85	900	1.900	47,37	37 or more	€ 90,00	1953		5	28,028	5,6	NO	YES
Delfshaven	Delfshaven	3024	AN	Coolhaven 236-238	507	1.098	46,17	37 or more		1942		5	22,696	4,5	NO	NO
Centrum	Cool	3011	AG	Coolsingel 120	19.020	21.309	89,26	37 or more		1991	F	26	96,818	3,7	YES	NO
Centrum	Cool	3012	AG	Coolsingel 139	4.628	24.062	19,23	37 or more	€ 155,00	1978	A	21	73,646	3,5	YES	NO
Centrum	CS-Kwartier	3013	AA	Delftseplein 30-33	1.315	7.061	18,62	37 or more	€ 195,00	1959	A	15	53,116	3,5	YES	NO
Centrum	Stadsdriehoek	3011 XJ	XJ	Glashaven 16-70	1.115	6.200	17,98	37 or more		1959		6	24,614	4,1	NO	NO
Centrum	Stadsdriehoek	3011 XH	XH	Glashaven 8-10	2.140	2.140	100,00	37 or more		1959		6	26,127	4,4	NO	NO
Centrum	Stadsdriehoek	3011 KE	KE	Goudsesingel 230	1.391	1.391	100,00	37 or more		1949		7	23,799	3,4	NO	NO
Centrum	Stadsdriehoek	3011 KD	KD	Goudsesingel 66-202	22.405	22.405	100,00	37 or more		1950		7	26,707	3,8	NO	NO
Ijsselmonde	Groot-Ijsselmonde Noord	3078 KG	KG	Groene Tuin 277-299	2.343	3.228	72,58	37 or more		1992		4	12,685	3,2	NO	YES
Centrum	Stadsdriehoek	3011 GG	GG	Hang 6	1.295	1.295	100,00	37 or more		1950		6	22,169	3,7	NO	NO
Centrum	Stadsdriehoek	3032 AC	AC	Hofplein 20	15.089	18.285	82,52	37 or more	€ 270,00	1995	C	27	93,434	3,5	NO	NO
Centrum	Stadsdriehoek	3011 AJ	AJ	Hofplein 33	2.062	3.300	62,48	37 or more	€ 165,00	1987		14	47,863	3,4	NO	NO
Kralingen-Crooswijk	Kralingen-Oost	3062 MB	MB	K.P. van der Mandelelaan 20	2.012	2.246	89,58	37 or more	€ 165,00	1990		6	20,862	3,5	NO	YES
Centrum	Nieuwe Werk-Dijkzigt	3016 AA	AA	Koningin Emmaplein 7	520	545	95,41	37 or more		1888		5	20,034	4,0068	NO	NO
Kralingen-Crooswijk	Kralingen-Oost	3062 ME	ME	Lichtenauerlaan 122-140	1.929	3.693	52,23	37 or more	€ 165,00	2000		6	22,694	3,8	NO	YES
Kralingen-Crooswijk	Kralingen-Oost	3062 ME	ME	Lichtenauerlaan 222-240	2.149	7.500	28,65	37 or more	€ 165,00	1995		4	12,423	3,1	NO	YES
Prins Alexander	Oosterflank	3068 AV	AV	Marten Meesweg 8-10	4.000	6.400	62,5	37 or more		1990	E	6	16,06	2,7	YES	NO
Centrum	Oude-Westen	3015 CJ	CJ	Mathenesserlaan 145	1.043	1.141	91,41	37 or more		1938		5	17,052	3,4	NO	NO
Kralingen-Crooswijk	Kralingen-Oost	3062 Ma	MA	Max Euwelaan 21-29	2.239	2.829	79,14	37 or more		1989		4	14,616	3,7	NO	YES
Kralingen-Crooswijk	Kralingen-Oost	3062 MA	MA	Max Euwelaan 55-57	634	1.191	53,23	37 or more	€ 145,00	1990		6	20,218	3,4	NO	YES
Noord	Oude-Noorden	3035 EM	EM	Noordsingel 113-117	765	6.580	11,63	37 or more	€ 75,00	1882	E	4	15,02	3,8	NO	NO
Kralingen-Crooswijk	Struisenburg	3063 AN	AN	Oostmaaslaan 59-71	16.875	17.500	96,43	37 or more	€ 165,00	1974	G	18	61,67	3,4	NO	NO
Kralingen-Crooswijk	Kralingen-West	3061 CH	CH	Oostplein 410-428	1.057	4.150	25,47	37 or more	€ 125,00	1993		14	45,926	3,3	NO	NO
Feijenoord	Kop van Zuid	3072 MD	MD	Otto Reuchlinweg 1008-1150	1.699	6.580	25,82	37 or more	€ 165,00	2005	A	42	143,184	3,4	YES	NO
Centrum	Nieuwe Werk-Dijkzigt	3016 BC	BC	Parklaan 38	675	675	100,00	37 or more	€ 200,00	1912	G	3	11,535	3,845	NO	NO
Delfshaven	Delfshaven	3024 BG	BG	Pieter de Hoochweg 111	430	953	45,12	37 or more	€ 135,00	1923		4	19,402	4,9	NO	NO
Feijenoord	Noordereiland	3071 KB	KB	Prins Hendrikkade 12-16	4.686	5.289	88,60	37 or more		1966	E	5	20,545	4,1	NO	NO
Feijenoord	Noordereiland	3071 KB	KB	Prins Hendrikkade 45-50	1.115	2.800	39,82	37 or more		2002		6	24,181	4,0	NO	NO
Noord	Provenierswijk	3033 EN	EN	Provenierssingel 66	515	1.120	45,98	37 or more		1898		3	11,566	3,9	NO	NO
Centrum	Oude-Westen	3015 EJ	EJ	Rochussenstraat 125	1.032	4.950	20,85	37 or more		1975		9	31,068	3,5	NO	NO
Centrum	Stadsdriehoek	3011 BH	BH	Schiedamse Vest 154	1.685	2.355	71,55	37 or more		1954		7	23,445	3,3	NO	NO
Centrum	Stadsdriehoek	3011 EM	EM	Schiedamsedijk 77	390	444	87,84	37 or more		1952		6	18,557	3,1	NO	NO
Noord	Provenierswijk	3033 BG	BG	Schiekade 101	1.473	3.133	47,02	37 or more		1937	B	4	14,007	3,5	NO	NO
Noord	Agniesebuurt	3032 AJ	AJ	Schiekade 34	2.293	8.521	26,91	37 or more		1946		8	25,89	3,2	NO	NO
Charlois	Oud-Charlois	3084 NG	NG	Schulpweg 37	3.400	6.129	55,47	37 or more		1970		7	23,335	3,3	NO	YES
Centrum	Oude-Westen	3014 EC	EC	s-Gravendijkwal 28-32	977	3.455	28,28	37 or more		1976		6	19,256	3,2	NO	NO
Centrum	Oude-Westen	3014 EG	EG	s-Gravendijkwal 68	860	860	100,00	37 or more		1905		4	12,98	3,2	NO	NO
Charlois	Oud-Charlois	3087 AD	AD	Sluisjesdijk 37	1.268	3.290	38,54	37 or more		1987	D	4	14,695	3,7	NO	YES
Centrum	CS-Kwartier	3013 AK	AK	Stationsplein 45	5.510	100.000	5,51	37 or more	€ 149,00	1948	A	9	38,097	4,2	YES	NO
Feijenoord	Vreewijk	3083 AS	AS	Strevelsweg 700	350	18.600	1,88	37 or more		1960	E	8	26,695	3,3	NO	YES
Charlois	Zuidplein	3083 BD	BD	Twentestraat 50-60	2.231	2.500	89,24	37 or more	€ 120,00	1990		7	22,151	3,2	NO	YES
Centrum	Stadsdriehoek	3011 BL	BL	Vasteland 10-40	4.423	8.100	54,60	37 or more	€ 165,00	1962	C	9	28,688	3,2	NO	NO
Hillegersberg-Schiebroek	Schiebroek	3053 JR	JR	Veldkersweg 27	1.822	1.822	100,00	37 or more		1983		2	5,956	3,0	NO	NO
Centrum	Stadsdriehoek	3011 PW	PW	Vlasmarkt 1	926	1.750	52,91	37 or more	€ 135,00	1954	D	8	24,518	3,1	NO	NO
Noord	Blijdorp	3033 AG	AG	Walenburgerweg 74	160	630	25,40	37 or more	€ 115,00	1972		5	17,157	3,4	NO	NO
Centrum	Cool	3012 NJ	NJ	Weena 200	4.069	17.600	23,12	37 or more	€ 175,00	1993	C	17	52,454	3,1	YES	NO
Centrum	Cool	3013 AL	AL	Weena 325-355	1.904	10.500	18,13	37 or more		1990	B	31	105,412	3,4	YES	NO
Centrum	Cool	3013 AL	AL	Weena 505	27.507	65.685	41,88	37 or more	€ 190,00	1992	B	28	93,147	3,3	YES	NO
Centrum	Cool	3012 CN	CN	Weena 690	9.024	13.600	66,35	37 or more		2000		36	125,657	3,5	YES	NO
Centrum	Cool	3012 CM	CM	Weena 70	3.809	10.688	35,64	37 or more		1990	C	18	58,332	3,2	YES	NO
Centrum	Cool	3012 KN	KN	Westblaak 180	3.295	8.470	38,90	37 or more	€ 145,00	1992		9	36,619	4,1	YES	NO
Centrum	Cool	3012 KN	KN	Westblaak 232	2.302	9.555	24,09	37 or more	€ 145,00	1972		9	29,706	3,3	YES	NO
Centrum	Cool	3012 KC	KC	Westblaak 5-11	577	4.300	13,42	37 or more		1955		8	29,885	3,7	YES	NO
Charlois	Zuidplein	3083 CW	CW	Zuidplein 2-18	2.158	3.500	61,66	37 or more	€ 125,00	1990		10	30,379	3,0	NO	YES

Table 23, overview of all structural vacant buildings sorted by street name

Appendix 2. Rotterdam district and neighborhood characteristics

District	Neighborhood	Distance to supermarket in km	on-ramp to highway	trainstation	hospital	general practitioner	cinema	restaurant	swimming pool	day care	elementary school	High school lower education	high school higher education
Centrum	Cool	0,2	3	1	1,1	0,7	0,4	0,1	1,6	0,2	0,5	1,7	0,7
	CS Kwartier	0,6	2	0,6	1,6	0,7	0,8	0,2	0,7	0,3	0,6	0,9	0,4
	Dijkzigt	0,4	3,3	1,9	0,7	0,5	1,3	0,2	1,7	0,4	0,6	1,4	0,8
	Nieuwe Werk	0,5				0,5				0,3	0,9		
	Oude Westen	0,3	2,5	1,1	0,9	0,3	0,8	0,2	0,8	0,2	0,3	1,4	0,6
	Stadsdriehoek	0,3	2,7	0,6	0,9	0,5	1	0,1	1,4	0,4	0,4	1	0,9
Charlois	Carnisse	0,3	3,4	4,2	1,4	0,3	4	0,3	0,9	0,4	0,4	0,5	0,7
	Heijplaat	0,4	2,7	9,2	7,1	4,6	9,7	0,3	1	4,6		4,9	5,2
	Oud-Charlois	0,5	3,4	5	2,4	0,4	4,5	0,4	1,9	0,4	0,3	0,6	0,8
	Pendrecht	0,4	2,2	4,8	2,9	0,4	5,8	0,5	2,5	0,4	0,4	1,3	1,3
	Tarwewijk	0,3	3,7	3,4	1,2	0,4	3,1	0,2	0,9	0,2	0,3	1	1,2
	Zuiderpark	0,6				0,6				0,6	0,5		
	Zuidrand	1,3				1,2				0,6	0,9		
	Zuidplein	0,2	3,1	3,7	0,8	0,4	3,5	0,1	0,3	0,7	0,8	0,5	0,9
	Zuidwijk	0,5	2,7	3,4	2	0,4	4,9	0,3	2,4	0,7	0,4	0,6	0,7
Delfshaven	Bospolder	0,3	2,5	3	1,9	0,4	2,9	0,2	2	0,2	0,2	0,6	1,5
	Delfshaven	0,5	3,4	3,1	1,2	0,5	2,4	0,1	2,2	0,6	0,4	0,5	0,5
	Middelland	0,3	2,4	1,6	1,1	0,3	1,4	0,2	0,7	0,2	0,3	0,9	0,6
	Nieuwe Westen	0,3	2,3	2,2	1,8	0,3	2,1	0,2	1,2	0,3	0,3	0,6	0,8
	Oud Mathenesse / Witte Dorp	0,4	1,1	1,2	3,5	0,4	1,9	0,3	0,9	0,3	0,4	0,9	2,5
	Schiemond	0,3	3,2	3,3	1,9	0,4	3,2	0,5	2,4	0,7	0,4	0,9	1,1
	Spangen	0,4	1,7	2,2	2,7	0,3	2,9	0,2	0,8	0,3	0,3	0,7	1,7
	Tussendijken	0,4	2,3	2,8	2	0,3	2,8	0,2	1,5	0,3	0,2	0,5	1,5
Feijenoord	Afrikaanderwijk	0,4	3,5	2,2	2	0,4	2	0,2	0,5	0,5	0,3	0,9	1,5
	Bloemhof	0,3	3,3	2,7	1,1	0,4	2,4	0,2	1,2	0,4	0,3	0,7	1,3
	Feijenoord	0,5	3,6	0,7	2,9	0,7	2	0,5	2,4	0,5	0,4	0,8	0,8
	Hillesluis	0,3	2,8	2,1	1,3	0,3	1,9	0,2	1,3	0,3	0,2	0,6	1,3
	Katendrecht	0,4	4,9	3,3	3	0,4	3,5	0,4	1,7	0,5	0,4	2,1	2,9
	Kop van Zuid	0,8				0,8		0,1		0,7	0,7		
	Kop van Zuid-Entrepot	0,3	3,6	1	2,6	0,3	2,1	0,3	1,9	0,2	0,3	0,6	0,6
	Noordereiland	0,3	4,3	1,6	2,1	0,8	2,2	0,2	2,6	0,8	1,3	1,6	1,6
	Vreewijk	0,6	2,3	2,1	0,7	0,7	3	0,3	1,8	0,6	0,4	0,8	0,7
Hillegersberg-Schiebroek	Hillegersberg-Noord	0,6	1,7	2,5	3,5	0,6	5,6	0,5	2,2	0,5	0,7	0,7	0,7
	Hillegersberg-Zuid	0,6	0,9	0,8	1,5	0,3	3,7	0,2	1,3	0,3	0,4	1,1	1,1
	Molenlaankwartier	0,6	2,2	2,9	4,4	1,1	6,1	0,5	3,2	0,6	0,4	0,9	1
	Schiebroek	0,5	1,7	2,4	2,3	0,6	5,2	0,3	1	0,3	0,4	0,6	1
	Terbregge	1,8	1,6	2,9	4,4	0,8	5,8	0,8	3,9	0,6		2,5	2,7
Ijsselmonde	Beverwaard	0,6	1,6	4,2	3,8	0,6	4	0,5	3	0,5	0,5	2,5	3,2
	Groot Ijsselmonde	0,7	1,5	2,1	1,8	0,5	3,1	0,7	1,6	0,6	0,5	0,8	1,6
	Lombardijen	0,6	2	1	1,4	0,4	3,7	0,4	2,9	0,6	0,5	1	1,3
	Oud Ijsselmonde	1,5	1,1	3,1	3,2	1,7	2	0,6	2	0,9	0,9	2	2,8
Kralingen-Crooswijk	De Esch	0,7	1,4	3,2	2,5	0,7	3,9	0,6	3	0,9	0,6	2,3	2,8
	Kralingen-Oost & Kralingse Bos	0,5	1,6	2,4	1,9	0,6	3,2	0,3	1,7	0,3	0,5	0,7	1,5
	Kralingen-West	0,3	2,3	1,6	1,2	0,5	2,4	0,2	0,7	0,4	0,5	0,5	0,5
	Nieuw Crooswijk	0,4	1,2	1,7	2,1	0,3	2,6	0,3	1,5	0,3	0,3	0,7	1,2
	Oud Crooswijk	0,4	1,5	1,7	1,6	0,4	2,3	0,3	1	0,3	0,2	0,7	0,8
	Rubroek	0,3	1,9	1,1	1,2	0,4	1,7	0,3	0,8	0,5	0,4	0,4	0,4
	Struisenburg	0,7	1,9	1,7	1,1	1	2,4	0,3	1,5	0,4	0,8	1,2	1,2
Noord	Agniesebuurt	0,4	1,4	1,3	2,1	0,3	1,6	0,3	1	0,7	0,5	0,3	0,5
	Bergpolder	0,4	0,6	1,7	1,3	0,4	2,4	0,2	0,5	0,2	0,4	0,5	0,8
	Blijdorp & Blijdorpsepolder	0,3	1,1	1,8	1,8	0,3	2	0,2	0,7	0,5	0,4	0,5	0,7
	Liskwartier	0,4	0,9	1,1	1,8	0,3	2,6	0,2	1	0,3	0,3	1	1
	Oude Noorden	0,4	0,9	1,1	2,3	0,5	2,3	0,2	1,6	0,3	0,3	0,8	1,1
	Provenierswijk	0,5	1,4	1,3	2,1	0,4	1,7	0,3	0,8	0,4	0,4	0,3	0,5
Overschie	Kleinpolder	0,4	0,7	3,4	3,1	0,7	3,7	0,4	0,8	1,1	0,4	2,5	2,4
	NoordKethel-Schieveen-Zestienhove	1,9	1,1	3,3	1,8	1,9	4,4	1,5	2	0,7	1,6	2,5	2,5
	Overschie	0,8	0,9	3,5	3,2	0,8	3,8	0,6	1,3	0,7	0,6	3,1	3,2
	Spaanse Polder	1,4	0,8	1,9	3,4	1,4	2,3	0,6	1,7	1,1	1,4	2	2,5
Prins Alexander	Het Lage Land	0,5	1,8	1,7	1,9	0,5	6,5	0,4	1,3	0,9	0,6	1	1,1
	Kralingseveer	1,7	1,7	5,3	3,8	0,6	6,1	0,4	2,6	1,1	1	2,8	3,3
	Nesselande	1,1	2,1	3,5	6,3	1	11,6	1,1	2,6	0,7	0,8	2,9	3,5
	Ommoord	0,6	2	2,7	3,9	0,9	8,2	0,8	2,7	1	0,5	2,2	2,2
	Oosterflank	0,6	1,5	1,1	1,3	0,6	7,8	0,6	1,7	0,8	0,5	0,4	0,5
	Prinsenland	0,8	1,7	2,7	1,6	0,9	6,2	0,7	1	0,6	0,4	1	1,3
	's-Gravenland	0,6	1,4	3,8	2,3	1,3	5,9	1,1	2	1	1,1	1,9	2,3
	Zevenkamp	0,6	1,7	2,4	4,1	0,7	10	0,7	0,8	0,6	0,4	1,2	1,2

Table 24, overview of locational characteristics part 1 of 3

District	Neighborhood	Number of residents	Number of households	people per household	1 person	couple no kids	couple with kids	0 to 14	15 to 24	25 to 44	45 to 64	65+	Average income
Centrum	Cool	5075	3290	1,5	64%	23%	13%	8%	13%	45%	20%	14%	€ 28.400,00
	CS Kwartier	1055	740	1,4	70%	23	9	6	14	50	22	9	€ 36.300,00
	Dijkzigt	700	560	1,2	81	14	5	4	29	52	8	6	€ 22.300,00
	Nieuwe Werk	1475	995	1,5	65	28	8	6	25	31	23	14	€ 41.100,00
	Oude Westen	9345	4975	1,8	55	18	27	14	16	30	26	14	€ 17.800,00
	Stadsdriehoek	14425	9575	1,5	63	26	11	8	15	48	19	11	€ 33.300,00
Charlois	Carnisse	11065	6055	1,8	53	20	27	17	13	42	19	9	€ 17.900,00
	Heijplaat	1330	665	2	41	27	32	14	13	24	32	17	€ 20.000,00
	Oud-Charlois	13220	6565	2	48	21	31	18	14	33	25	11	€ 17.800,00
	Pendrecht	11630	5485	2,1	45	18	36	21	13	31	22	13	€ 16.700,00
	Tarwewijk	12295	6110	2	48	19	33	20	17	37	21	6	€ 14.800,00
	Zuiderpark	970	325	1,4	69%	23%	9%	3%	8%	15%	19%	56%	€ 23.800,00
	Zuidrand	365	140	2,2	36	28	36	12	8	27	32	21	€ 28.500,00
	Zuidplein	1205	745	1,6	60	26	15	11	8	39	22	20	€ 24.000,00
	Zuidwijk	12180	6355	1,9	51	21	28	17	12	27	24	20	€ 18.100,00
Delfshaven	Bospolder	7155	3350	2,1	47	17	36	19	17	29	25	9	€ 14.700,00
	Delfshaven	6745	3890	1,7	61	18	21	14	21	38	21	7	€ 17.800,00
	Middelland	11810	6660	1,8	58	19	23	14	20	36	22	8	€ 20.900,00
	Nieuwe Westen	19205	9485	2	50	19	31	18	18	33	23	8	€ 17.100,00
	Oud Mathenesse / Witte Dorp	7065	3990	1,8	56	20	25	16	13	40	21	11	€ 17.800,00
	Schiemond	5040	2495	2	43	25	33	19	9	35	25	12	€ 24.400,00
	Spangen	10375	4565	2,3	42	17	41	21	18	32	22	7	€ 15.100,00
	Tussendijken	7060	3645	1,9	54	17	30	18	16	32	23	12	€ 14.400,00
Feijenoord	Afrikaanderwijk	8200	3705	2,2	45	17	38	19	16	28	25	12	€ 13.100,00
	Bloemhof	13660	6440	2,1	45	19	36	19	16	31	24	10	€ 14.400,00
	Feijenoord	7185	3180	2,2	42	17	42	21	15	29	24	12	€ 14.100,00
	Hillesluis	11850	5315	2,2	43	19	38	20	17	34	21	8	€ 14.400,00
	Katendrecht	4600	2170	2,1	43	21	36	22	11	32	24	11	€ 20.600,00
	Kop van Zuid	2075	1405	1,5	65	25	11	8	17	56	15	4	€ 40.700,00
	Kop van Zuid-Entrepot	8340	4035	2,1	42	25	33	19	11	34	26	11	€ 24.100,00
	Noordereiland	3290	1965	1,7	57	24	20	12	11	35	27	15	€ 24.700,00
	Vreewijk	13790	7145	1,9	47	23	30	15	12	23	30	20	€ 17.700,00
Hillegersberg-Schiebroek	Hillegersberg-Noord	7760	3810	2	45	27	29	17	8	22	27	26	€ 33.500,00
	Hillegersberg-Zuid	7940	3830	2,1	41	27	32	19	10	35	25	11	€ 28.500,00
	Molenlaankwartier	7905	3315	2,3	35	26	39	23	8	20	26	24	€ 39.500,00
	Schiebroek	16265	7770	2	47	19	34	20	10	26	25	19	€ 23.100,00
	Terbregge	3540	1345	2,6	21	26	54	23	12	24	33	10	€ 30.600,00
Ijsselmonde	Beverwaard	11700	5010	2,3	33	20	47	21	14	28	28	9	€ 17.600,00
	Groot Ijsselmonde	27650	13580	2	45	24	31	16	11	26	24	23	€ 19.300,00
	Lombardijen	13575	6805	1,9	49	21	30	18	12	28	23	19	€ 18.500,00
	Oud Ijsselmonde	5960	2770	2,1	34	32	34	15	11	29	32	13	€ 26.300,00
Kralingen-Crooswijk	De Esch	4350	2675	1,6	59	22	19	11	14	32	26	17	€ 23.400,00
	Kralingen-Oost & Kralingse Bos	7785	4230	1,8	56	23	21	16	22	26	21	15	€ 40.600,00
	Kralingen-West	15650	8920	1,7	58	21	22	14	19	34	21	12	€ 21.100,00
	Nieuw Crooswijk	2730	1530	1,8	54	23	24	15	13	42	21	10	€ 19.600,00
	Oud Crooswijk	8140	4040	2	50	17	33	18	15	29	24	14	€ 14.900,00
	Rubroek	8220	4690	1,7	58	20	22	13	17	35	21	15	€ 20.000,00
	Struisenburg	5070	3705	1,4	73	21	7	5	30	35	16	14	€ 28.200,00
Noord	Agniesebuurt	4055	2340	1,7	61	15	24	14	17	36	22	11	€ 18.400,00
	Bergpolder	7950	5060	1,6	63	23	15	11	16	52	15	7	€ 23.100,00
	Blijdorp & Blijdorpsepolder	10080	5885	1,7	55	26	20	13	10	44	20	13	€ 29.700,00
	Liskwartier	7560	3930	1,9	51	22	28	17	13	36	23	12	€ 22.500,00
	Oude Noorden	16910	8815	1,9	53	19	29	17	16	34	24	10	€ 17.400,00
	Provenierswijk	4615	2665	1,7	59	21	20	13	18	40	20	10	€ 21.900,00
Overschie	Kleinpolder	7535	3855	1,9	49	21	29	17	11	29	24	19	€ 19.300,00
	NoordKethel-Schieveen-Zestienhove	1755	575	2,8	18	26	57	27	6	33	21	14	€ 30.700,00
	Overschie	6690	3130	2,1	36	29	35	17	10	27	30	16	€ 23.900,00
	Spaanse Polder	110	60	1,8	50	42	25	9	5	23	46	23	€ 28.100,00
Prins Alexander	Het Lage Land	10565	5845	1,8	53	24	24	13	13	27	24	24	€ 22.400,00
	Kralingseveer	1690	735	2,3	33	28	41	19	11	29	30	12	€ 22.000,00
	Nesselande	12300	4365	2,8	21	23	57	30	8	33	21	8	€ 28.700,00
	Ommoord	25005	12745	1,9	44	29	27	13	10	20	26	31	€ 22.700,00
	Oosterflank	10500	5455	1,9	49	22	30	15	10	26	29	20	€ 21.700,00
	Prinsenland	9755	4995	1,9	45	26	29	13	11	21	32	23	€ 26.200,00
	's-Gravenland	8190	3520	2,3	31	27	42	17	15	19	36	14	€ 34.400,00
	Zevenkamp	16080	7195	2,2	37	23	40	17	13	25	31	14	€ 21.500,00

Table 25, overview of locational characteristics part 2 of 3

District	Neighborhood	Average asking price	Average price per sqm	Average floor space	type of housing	building period
Centrum	Cool	€ 328.333,00	€ 3.532,00	97	ry flat, semi-detached, Penthouse	1954-2011
	CS Kwartier	€ 348.500,00	€ 3.448,00	102	lat, portico apartment, penthouse	
	Dijkzigt	€ 372.300,00	€ 3.775,00	100		
	Nieuwe Werk	€ 492.879,00	€ 4.259,00	113	tment, Penthouse, semi-detached	1978-2018
	Oude Westen	€ 529.771,00	€ 2.751,00	172	ouse, Detached house, Gallery flat	1909-1994
	Stadsdriehoek	€ 331.744,00	€ 3.576,00	90	ached house, Country house, Villa	1955-2002
Charlois	Carnisse	€ 118.291,00	€ 1.735,00	88	amily house, Mansion, Gallery flat	1939-1947
	Heijplaat	€ 260.417,00	€ 1.849,00	133	ngle-family house, Semi-detached	
	Oud-Charlois	€ 149.522,00	€ 1.757,00	86	sonette, Gallery flat, Corner house	1938-1971
	Pendrecht	€ 148.287,00	€ 1.776,00	80	tached house, Upstairs apartment	1958-1961
	Tarwewijk	€ 137.624,00	€ 1.654,00	85	ily house, Penthouse, Maisonette	1934-1968
	Zuiderpark	€ 517.375,00	€ 3.725,00	147	Detached house, Villa	
	Zuidrand	€ 542.148,00	€ 3.915,00	147	family house, Villa, Semi-detached	
	Zuidplein	€ 147.125,00	€ 1.851,00	81	portico apartment, gallery flat	1979-1992
	Zuidwijk	€ 151.712,00	€ 1.838,00	80	etached, End house, Ground floor	1960-2001
Delfshaven	Bospolder	€ 224.325,00	€ 2.089,00	109	rtment, Portiekflat, Corner house	1911-2006
	Delfshaven	€ 239.600,00	€ 2.369,00	98	allery flat, Detached house, House	1930-1989
	Middelland	€ 437.594,00	€ 2.683,00	166	se, Corner house, Attached house	1903-1940
	Nieuwe Westen	€ 381.530,00	€ 2.501,00	137	e-family house, Portico apartment	1911-1930
	Oud Mathenesse / Witte Dorp	€ 111.448,00	€ 1.668,00	68	irs apartment, Single-family house	1938-1950
	Schiemond	€ 349.798,00	€ 3.020,00	112	e, Upstairs Apartment, Penthouse	1984-2007
	Spangen	€ 163.650,00	€ 1.802,00	90	lat, Country house, Tussenwoning	1943-2007
	Tussendijken	€ 262.211,00	€ 2.146,00	113	lat, Downstairs apartment, Duplex	1924-1954
Feijenoord	Afrikaanderwijk	€ 241.857,00	€ 1.978,00	123	nt, single-family house, Penthouse	
	Bloemhof	€ 147.992,00	€ 1.657,00	88	ery flat, Maisonette, Corner house	1926-1982
	Feijenoord	€ 222.950,00	€ 2.172,00	98	Upstairs apartment	
	Hillesluis	€ 165.829,00	€ 1.726,00	99	ortiekflat, Corner house, Mansion	1927-1940
	Katendrecht	€ 378.433,00	€ 3.972,00	111	use, Mansion, Duplex, Upper floor	1903-2009
	Kop van Zuid	€ 501.786,00	€ 3.185,00	141	ng, Galerijflat, Upstairs apartment	2002-2005
	Kop van Zuid-Entrepot	€ 309.341,00	€ 2.733,00	112	ng, Galerijflat, Upstairs apartment	1981-2000
	Noordereiland	€ 266.076,00	€ 2.787,00	117	apartment, Semi-detached house	1894-1955
	Vreewijk	€ 163.551,00	€ 1.778,00	96	house, End house, Attached house	1933-1941
Hillegersberg-Schiebroek	Hillegersberg-Noord	€ 697.756,00	€ 4.053,00	153	Penthouse, Semi-detached house	1925
	Hillegersberg-Zuid	€ 301.226,00	€ 2.757,00	105	hed house, Penthouse, Gallery flat	1927-1933
	Molenlaankwartier	€ 677.565,00	€ 4.122,00	158	nily house, Townhouse, Galerijflat	1957-1965
	Schiebroek	€ 307.047,00	€ 2.833,00	104	ched house, Villa, Detached house	1950-1985
	Terbregge	€ 477.466,00	€ 3.201,00	147	Semi-Detached House, End House	2000-2002
Ijsselmonde	Beverwaard	€ 180.374,00	€ 1.703,00	242	r, End house, Portiekflat, Upstairs	1982-1985
	Groot Ijsselmonde	€ 180.223,00	€ 1.918,00	89	ent, Duplex, Mansion, Townhouse	1962-1980
	Lombardijen	€ 170.872,00	€ 1.844,00	82	ached house, Semi-detached, Villa	1961-1964
	Oud Ijsselmonde	€ 257.887,00	€ 2.375,00	109	tairs apartment, Villa, Maisonette	1938-2001
Kralingen-Crooswijk	De Esch	€ 203.000,00	€ 2.638,00	76	Portico apartment, upstairs house	1984-1988
	Kralingen-Oost & Kralingse Bos	€ 831.987,00	€ 4.026,00	199	ched house, Semi-detached house	1907-1958
	Kralingen-West	€ 351.305,00	€ 3.185,00	107	se, Corner house, Detached house	1907-1938
	Nieuw Crooswijk	€ 358.000,00	€ 3.273,00	110		
	Oud Crooswijk	€ 200.139,00	€ 2.590,00	78	nily house, Downstairs apartment	
	Rubroek	€ 200.861,00	€ 2.911,00	69	ownstairs apartment, Maisonette	1946-1955
	Struisenburg	€ 394.054,00	€ 3.228,00	119	flat, Penthouse, Upstairs, Mansion	1935-1996
Noord	Agniesebuurt	€ 399.447,00	€ 2.866,00	137	ment, Downstairs house, Mansion	1941-1981
	Bergpolder	€ 208.165,00	€ 2.778,00	77	Gallery flat, Maisonette, Mansion	1933-1936
	Blijdorp & Blijdorpsepolder	€ 270.305,00	€ 2.978,00	93	tached house, Single family house	1933-1938
	Liskwartier	€ 324.609,00	€ 2.734,00	121	use, Single-family house, Mansion	1909-1916
	Oude Noorden	€ 256.340,00	€ 2.667,00	96	house, Corner house, Maisonette	1910-1987
	Provenierswijk	€ 323.200,00	€ 2.741,00	121	ssenwoning, Herenhuis, Galerijflat	1901-1981
Overschie	Kleinpolder	€ 268.559,00	€ 2.231,00	115	ouse, Townhouse, Villa, Portiekflat	1941-1977
	NoordKethel-Schieveen-Zestienhove	€ 617.444,00	€ 3.276,00	157	etached house, End house, House	
	Overschie	€ 277.065,00	€ 2.313,00	114	r house, Semi-detached, Mansion	1932-1939
	Spaanse Polder	€ 635.000,00	€ 2.668,00	238	Villa, detached house	
Prins Alexander	Het Lage Land	€ 193.981,00	€ 2.053,00	94	orner house, Gallery flat, Upstairs	1965-1969
	Kralingseveer	€ 185.104,00	€ 1.986,00	95	, Townhouse, End House, Upstairs	1918-1938
	Nesselande	€ 463.776,00	€ 3.021,00	150	lerijflat, Eindwoning, Maisonnette	2005-2010
	Ommoord	€ 207.302,00	€ 2.021,00	105	ached house, Portiekflat, Mansion	1971-1973
	Oosterflank	€ 207.366,00	€ 2.173,00	96	, End house, Gallery flat, Mansion	1980-1981
	Prinsenland	€ 346.866,00	€ 2.710,00	122	d house, Semi-detached, Mansion	1992-1995
	's-Gravenland	€ 701.527,00	€ 3.649,00	179	er house, Groundfloor, Bungalow	1993-2002
	Zevenkamp	€ 257.225,00	€ 2.113,00	117	ched, Mansion, Villa, End dwelling	1982-1988

Table 26, overview of locational characteristics part 3 of 3

Appendix 3. Step 1, Appraisal using veto criteria

Adress	VETO	There is a demand for housing of local target groups (Y/N)	Building is structurall y vacant (Y/N)	Not Located in Office Zone (Y/N)	Zoning plan permits modificati on (Y/N)	No serious public health risk (pollution, noise, odour) (Y/N)	Free ceiling height > 2.60m (Y/N)	Answer 'Yes' (score=1) Answer 'No' (score=0)
Aert van Nesstraat 45		1	1	0	1	1	1	5
Blaak 20-40		1	1	0	1	1	1	5
Blaak 555		1	1	0	1	1	1	5
Boompjes 40		1	1	1	1	1	1	6
Boompjes 250		1	1	1	1	1	1	6
Boompjes 545		1	1	1	1	1	1	6
Boterdiep 46-50		1	1	1	1	1	1	6
Brielselaan 85		1	1	1	1	1	1	6
Coolhaven 236-238		1	1	1	1	1	1	6
Coolsingel 120		1	1	0	1	1	1	5
Coolsingel 139		1	1	0	1	1	1	5
Delftseplein 30-33		1	1	0	1	1	1	5
Glashaven 8-10		1	1	1	1	1	1	6
Glashaven 16-70		1	1	1	1	1	1	6
Goudsesingel 66-202		1	1	1	1	1	1	6
Goudsesingel 230		1	1	1	1	1	1	6
Groene Tuin 277-299		1	1	1	1	1	1	6
Hang 6		1	1	1	1	1	1	6
Hofplein 20		1	1	1	1	1	1	6
Hofplein 33		1	1	1	1	1	1	6
Koningin Emmaplein 7		1	1	1	1	1	1	6
K.P. van der Mandelelaan 20		1	1	1	1	1	1	6
Lichtenauerlaan 122-140		1	1	1	1	1	1	6
Lichtenauerlaan 222-240		1	1	1	1	1	1	6
Marten Meesweg 8-10		1	1	0	1	1	1	5
Mathenesserlaan 145		1	1	1	1	1	1	6
Max Euwelaan 21-29		1	1	1	1	1	1	6
Max Euwelaan 55-57		1	1	1	1	1	1	6
Noordsingel 113-117		1	1	1	1	1	1	6
Oostmaaslaan 59-71		1	1	1	1	1	1	6
Oostplein 410-428		1	1	1	1	1	1	6
Otto Reuchlinweg 1008-1150		1	1	0	1	1	1	5
Parklaan 38		1	1	1	1	1	1	6
Pieter de Hoochweg 111		1	1	1	1	1	1	6
Prins Hendrikkade 12-16		1	1	1	1	1	1	6
Prins Hendrikkade 45-50		1	1	1	1	1	1	6
Provenierssingel 66		1	1	1	1	1	1	6
Rochussenstraat 125		1	1	1	1	1	1	6
Schiedamsedijk 77		1	1	1	1	1	1	6
Schiedamse Vest 154		1	1	1	1	1	1	6
Schiekade 34		1	1	1	1	1	1	6
Schiekade 101		1	1	1	1	1	1	6
Schulpweg 37		1	1	1	1	1	1	6
s-Gravendijkwal 28-32		1	1	1	1	1	1	6
s-Gravendijkwal 68		1	1	1	1	1	1	6
Sluisjesdijk 37		1	1	1	1	1	1	6
Stationsplein 45		1	1	0	1	1	1	5
Strevelsweg 700		1	1	1	1	1	1	6
Twentestraat 50-60		1	1	1	1	1	1	6
Vasteland 10-40		1	1	1	1	1	1	6
Veldkersweg 27		1	1	1	1	1	1	6
Vlasmarkt 1		1	1	1	1	1	1	6
Walenburgerweg 74		1	1	1	1	1	1	6
Weena 70		1	1	0	1	1	1	5
Weena 200		1	1	0	1	1	1	5
Weena 325-355		1	1	0	1	1	1	5
Weena 505		1	1	0	1	1	1	5
Weena 690		1	1	0	1	1	1	5
Westblaak 5-11		1	1	0	1	1	1	5
Westblaak 180		1	1	0	1	1	1	5
Westblaak 232		1	1	0	1	1	1	5
Zuidplein 2-18		1	1	1	1	1	1	6

Table 27, overview of step 1, quick scan with veto criterion

Appendix 4. Step 2, Further appraisal of location

Adress	LOCATION	Building in suitable area (not remote industrial or offices area) (Y/N)	Good Daylight / sunlight possibilities (Y/N)	Good view from building, > 75% floor space (Y/N)	Shop for daily necessities < 500m (Y/N)	Neighbourhood meeting places (square, park) < 500m (Y/N)	Food service industry (bar, café, restaurant) < 500m (Y/N)	Basic medical facilities (practice, health center) < 2km (Y/N)	Sports facilities (fitness, swimming pool, sports park) < 2km (Y/N)	Educational facilities (from kindergarten to university) < 2km (Y/N)	Distance to railway station < 2km (Y/N)	Distance to bus, tram underground < 500m (Y/N)	Good flow, normal street quality (Y/N)	Distance to parking < 250m (Y/N)	> 1 parking lot / 100m² office space (Y/N)	Situated centrally (not near highway locations) (Y/N)	Other buildings present in direct neighbourhood (Y/N)	Lively neighbourhood (Y/N)	Direct availability of green environment (Y/N)	Area has a good reputation/image; no vandalism (Y/N)	Area has good air quality and low pollution and noise hindrance (Y/N)	Noise load on façade < 50dB (e.g. max. for office building is 60 dB) (Y/N)	Land in property or with short lease (Y/N)	Answer 'Yes' (score=1) Answer 'No' (score=0)	Location score
Aert van Nesstraat 45																									
Blaak 20-40																									
Blaak 555																									
Boompjes 40		1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	0	19	95
Boompjes 250		1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	0	19	95
Boompjes 545		1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	0	19	95
Boterdiep 46-50		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	20	100
Brielselaan 85		1	1	1	1	0	1	0	1	1	0	1	1	1	0	1	1	0	0	0	1	1	0	14	
Coolhaven 236-238		1	1	0	0	1	1	1	1	1	0	1	1	1	0	1	1	0	0	0	1	1	0	14	
Coolsingel 120																									
Coolsingel 139																									
Delftseplein 30-33																									
Glashaven 8-10		1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	0	18	90
Glashaven 16-70		1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	0	19	95
Goudsesingel 66-202		1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	0	19	95
Goudsesingel 230		1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	0	18	90
Groene Tuin 277-299		1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	0	1	1	0	18	90
Hang 6		1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	0	18	90
Hofplein 20		1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	0	19	95
Hofplein 33		1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	0	18	90
Koningin Emmaplein 7		1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	0	19	95
K.P. van der Mandelelaan 20		0	1	1	0	1	1	1	1	1	0	1	1	1	1	0	1	0	1	1	1	0	0	15	75
Lichtenauerlaan 122-140		0	1	1	0	1	0	0	1	1	0	1	1	1	1	0	1	0	1	1	1	0	0	13	
Lichtenauerlaan 222-240		0	1	1	0	1	1	1	1	1	0	1	1	1	0	0	1	0	1	1	1	0	0	14	
Marten Meesweg 8-10																									
Mathenesserlaan 145		1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	0	1	0	1	1	0	17	85
Max Euwelaan 21-29		0	1	1	0	1	0	0	1	1	0	1	1	1	1	0	1	0	1	0	1	0	0	12	
Max Euwelaan 55-57		0	1	1	0	1	0	0	1	1	0	1	1	1	1	0	1	0	1	0	1	0	0	12	
Noordsingel 113-117		1	1	0	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	0	1	1	0	17	85
Oostmaaslaan 59-71		1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	0	1	0	1	1	0	17	85
Oostplein 410-428		1	1	0	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	0	1	1	0	17	85
Otto Reuchlinweg 1008-1150																									
Parklaan 38		1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	0	19	95
Pieter de Hoochweg 111		1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	0	1	1	0	18	90
Prins Hendrikkade 12-16		1	1	1	1	1	1	1	1	1	0	1	1	1	0	0	1	1	1	0	1	1	0	17	85
Prins Hendrikkade 45-50		1	0	0	1	1	1	1	0	1	0	1	1	1	0	1	1	1	1	0	1	1	0	15	75
Provenierssingel 66		1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	20	100
Rochussenstraat 125		1	0	0	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	0	1	1	0	16	80
Schiedamsedijk 77		1	0	0	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	0	1	1	0	16	80
Schiedamse Vest 154		1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	0	1	1	0	18	90
Schiekade 34		1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	0	1	1	0	18	90
Schiekade 101		1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	20	100
Schulpweg 37		1	1	1	1	1	1	1	1	1	0	1	1	1	0	0	1	0	1	0	1	1	0	16	80
s-Gravendijkwal 28-32		1	1	0	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	0	1	1	0	17	85
s-Gravendijkwal 68		1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	0	1	1	0	18	90
Sluisjesdijk 37		0	1	0	0	0	0	0	1	0	0	1	1	1	1	0	0	0	1	0	1	1	0	9	
Stationsplein 45																									
Strevelsweg 700		1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	0	1	1	0	18	90
Twentestraat 50-60		1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	0	1	1	0	18	90
Vasteland 10-40		1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	0	1	1	0	18	90
Veldkersweg 27		0	1	1	0	1	1	1	1	1	0	1	1	1	0	1	1	0	1	0	1	1	0	15	75
Vlasmarkt 1		1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1	0	0	1	1	0	17	85
Walenburgerweg 74		1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	0	0	18	90
Weena 70																									
Weena 200																									
Weena 325-355																									
Weena 505																									
Weena 690																									
Westblaak 5-11																									
Westblaak 180																									
Westblaak 232																									
Zuidplein 2-18		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	20	100
Criteria totals		38	42	33	37	43	41	40	44	44	16	45	45	45	8	37	44	31	42	7	45	39	0		

Table 28, overview of step 2, further appraisal of location

Appendix 5. Step 3, further appraisal of building

Adress	BUILDING	Building > 3 years (Y/N)	Building renovated > 3 years (Y/N)	Complete building is vacant (Y/N)	Building vacant > 3 years (Y/N)	Capacity building, 20 1p-units / 50m² (Y/N)	Layouts acceptable for target groups (Y/N)	Horizontal extension building possible (neighbouring buildings) (Y/N)	Vertical extension building possible (no inclined roof/light construction) (Y/N)	Possibilities for constructing basement (Y/N)	Identifiable compared to surrounding buildings (Y/N)	Own identity realisable (Y/N)	Being not a cultural heritage; simplifies transformation (Y/N)	Clear, safe and clarifying building entrance (Y/N)	Well maintained; maintenance up-to-date (Y/N)	Depth of building < 10 m (Y/N)	Grid support structure > 3.60 m (Y/N)	Height dimension between floors < 6.00 m (Y/N)	Condition support structure is good / not hazardous (Y/N)	Possible connection inner walls on grid < 5.40 m (Y/N)	Façade/openings well adaptable (Y/N)	Façade windows can be reused / opened (Y/N)	Sufficient service ducts can be constructed (Y/N)	Absence of large amount of hazardous materials in building (Y/N)	Acoustic insulation of floors > 5 dB (Y/N)	Good thermal insulation of façades and roof (Y/N)	Sufficient daylight factor > 90% floor surface new units (Y/N)	Elevator available / Easy realisable in building (> 4 stories) (Y/N)	(Emergency) stairways available / realisable (Y/N)	Distance of new units to stairs / elevators < 50 m (Y/N)	Answer 'Yes' (score=1) Answer 'No' (score=0)	Building score
Aert van Nesstraat 45	0																															
Blaak 20-40	0																															
Blaak 555	0																															
Boompjes 40	1	1	0	0	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	24	72
Boompjes 250	1	1	0	0	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1		1	1	0	1	0	1	1	1	1	21	63
Boompjes 545	1	1	0	1	1	1	1	0	1	0	0	1	1	0	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	22	66
Boterdiep 46-50	1	1	0	0	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	22	66
Brielselaan 85	0																															
Coolhaven 236-238	0																															
Coolsingel 120	0																															
Coolsingel 139	0																															
Delftseplein 30-33	0																															
Glashaven 8-10	1	1	0	1	1	1	1	0	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	0	1	1	1	19	57
Glashaven 16-70	1	1	0	0	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	0	1	1	1	1	22	66
Goudsesingel 66-202	1	1	0	1	1	1	1	0	0	0	1	1	1	0	0	1	1	1	1	1	0	0	1	0	0	0	0	1	1	1	17	51
Goudsesingel 230	1	1	0	1	1	1	1	0	0	0	1	1	0	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	22	66
Groene Tuin 277-299	1	1	0	0	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	24	72
Hang 6	1	1	0	1	1	1	1	0	0	0	1	1	1	0	0	1	1	1	1	1	0	0	1	0	1	0	1	0	1	1	18	54
Hofplein 20	1	1	0	0	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	0	1	1	1	1	22	66
Hofplein 33	1	1	0	0	1	1	1	0	1	0	1	1	1	0	1	1	1	1	1	1	1	0	1	0	1	0	0	1	1	1	20	60
Koningin Emmaplein 7	1	1	0	0	1	0	1	0	0	0	1	1	0	1	1	1	1	1	1	0	0	1	1	0	0	0	0	0	1	1	15	45
K.P. van der Mandelelaan 20	1	1	0	0	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	23	69
Lichtenauerlaan 122-140	0																															
Lichtenauerlaan 222-240	0																															
Marten Meesweg 8-10	0																															
Mathenesserlaan 145	1	1	0	0	1	0	1	0	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	1	0	0	1	1	1	18	54
Max Euwelaan 21-29	0																															
Max Euwelaan 55-57	0																															
Noordsingel 113-117	1	1	0	0	1	1	1	0	0	0	1	1	0	1	1	1	1	1	1	1	0	0	1	0	0	0	0	1	1	1	17	51
Oostmaaslaan 59-71	1	1	0	0	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	1	0	1	0	1	1	1	1	20	60
Oostplein 410-428	1	1	0	0	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	0	1	1	1	1	21	63
Otto Reuchlinweg 1008-1150	0																															
Parklaan 38	1	1	0	1	1	0	1	0	0	0	1	1	0	1	1	1	1	1	1	1	0	0	1	0	0	0	1	1	1	1	18	54
Pieter de Hoochweg 111	1	1	0	0	1	0	1	0	0	0	1	1	0	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	20	60
Prins Hendrikkade 12-16	1	1	0	0	1	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	23	69
Prins Hendrikkade 45-50	1	1	0	0	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	23	69
Provenierssingel 66	1	1	0	0	1	0	0	0	0	0	1	1	0	1	1	1	1	1	1	1	0	1	0	0	0	1	1	1	1	1	17	51
Rochussenstraat 125	1	1	0	0	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0	1	1	1	1	1	21	63
Schiedamsedijk 77	1	1	0	0	1	0	1	0	0	0	1	1	1	1	0	1	1	0	1	1	0	0	1	0	1	0	0	0	1	1	15	45
Schiedamse Vest 154	1	1	0	0	1	1	1	0	0	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	1	1	1	18	54
Schiekade 34	1	1	0	0	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	0	1	0	1	0	1	1	1	1	21	63
Schiekade 101	1	1	0	0	1	1	0	0	0	0	1	1	0	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	20	60
Schulpweg 37	1	1	0	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	1	1	0	0	1	1	1	1	1	22	66
s-Gravendijkwal 28-32	1	1	0	0	1	1	1	0	0	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	1	1	1	18	54
s-Gravendijkwal 68	1	1	0	1	1	0	1	0	0	0	1	1	0	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	1	1	16	48
Sluisjesdijk 37	0																															
Stationsplein 45	0																															
Strevelsweg 700	1	1	0	0	1	1	1	0	0	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	1	0	1	1	1	1	19	57
Twentestraat 50-60	1	1	0	0	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	23	69
Vasteland 10-40	1	1	0	0	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	0	1	0	1	0	1	1	1	1	21	63
Veldkersweg 27	1	1	0	1	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	25	75
Vlasmarkt 1	1	1	0	0	1	1	1	0	0	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	1	0	1	1	1	1	19	57
Walenburgerweg 74	1	1	0	0	1	0	1	0	0	0	1	1	1	0	0	1	1	1	1	1	0	0	1	0	1	0	1	1	1	1	17	51
Weena 70	0																															
Weena 200	0																															
Weena 325-355	0																															
Weena 505	0																															
Weena 690	0																															
Westblaak 5-11	0																															
Westblaak 180	0																															
Westblaak 232	0																															
Zuidplein 2-18	1	1	0	0	1	1	1	0	0	0	1	1	1	1	0	1	1	1	1	1	0	1	1	0	1	0	0	1	1	1	19	57
	38	38	0	8	38	29	30	6	18	0	37	38	30	33	24	38	38	37	38	37	8	16	37	2	27	15	30	34	38	38		

Table 29, overview of step 3, further appraisal of building

Appendix 6. Step 5, Financial appraisal

Adress	Year of construction	Floors	Building Height	Floor to ceiling height	Total LFA	Form Factor	Residential selling price per sqm	Average size residential unit	Size*Form factor	Units per building	Revenu	Construction + aquisition costs	Potential profit
Aert van Nesstraat 45	1976	11	58,8	5,3	24047	1,3	€ 3.532	97	126,1	190	€ 65.094.760	€ 35.830.030	€ 29.264.730
Blaak 20-40	1978	5	34,4	6,9	15870	1,3	€ 3.576	90	117	135	€ 43.448.400	€ 23.646.300	€ 19.802.100
Blaak 555	1996	23	104,9	4,6	32056	1,3	€ 3.576	90	117	273	€ 87.862.320	€ 47.763.440	€ 40.098.880
Boompjes 40	1988	24	90,1	3,8	40585	1,3	€ 3.576	90	117	346	€ 111.356.640	€ 60.471.650	€ 50.884.990
Boompjes 250	1988	6	31,2	5,2	9000	1,3	€ 3.576	90	117	76	€ 24.459.840	€ 13.410.000	€ 11.049.840
Boompjes 545	1988	22	71,5	3,3	1560	1,3	€ 3.576	90	117	13	€ 4.183.920	€ 2.324.400	€ 1.859.520
Boterdiep 46-50	1986	3	14,5	4,8	1200	1,3	€ 2.375	109	141,7	8	€ 2.071.000	€ 1.788.000	€ 283.000
Brielselaan 85	1953	5	28,0	5,6	1900	1,3	€ 1.654	85	110,5	17	€ 2.390.030	€ 2.831.000	€ -440.970
Coolhaven 236-238	1942	5	22,7	4,5	1098	1,3	€ 2.369	98	127,4	8	€ 1.857.296	€ 1.636.020	€ 221.276
Coolsingel 120	1991	26	96,8	3,7	21309	1,3	€ 3.532	97	126,1	168	€ 57.557.472	€ 31.750.410	€ 25.807.062
Coolsingel 139	1978	21	73,6	3,5	24062	1,3	€ 3.532	97	126,1	190	€ 65.094.760	€ 35.852.380	€ 29.242.380
Delftseplein 30-33	1959	15	53,1	3,5	7061	1,3	€ 3.448	102	132,6	53	€ 18.639.888	€ 10.520.890	€ 8.118.998
Glashaven 8-10	1959	6	26,1	4,4	2140	1,3	€ 3.576	90	117	18	€ 5.793.120	€ 3.188.600	€ 2.604.520
Glashaven 16-70	1959	6	24,6	4,1	6200	1,3	€ 3.576	90	117	52	€ 16.735.680	€ 9.238.000	€ 7.497.680
Goudsesingel 66-202	1950	7	26,7	3,8	22405	1,3	€ 3.576	90	117	191	€ 61.471.440	€ 33.383.450	€ 28.087.990
Goudsesingel 230	1949	7	23,8	3,4	1391	1,3	€ 3.576	90	117	11	€ 3.540.240	€ 2.072.590	€ 1.467.650
Groene Tuin 277-299	1992	4	12,7	3,2	3228	1,3	€ 1.918	89	115,7	27	€ 4.608.954	€ 4.809.720	€ -200.766
Hang 6	1950	6	22,2	3,7	1295	1,3	€ 3.576	90	117	11	€ 3.540.240	€ 1.929.550	€ 1.610.690
Hofplein 20	1995	27	93,4	3,5	18285	1,3	€ 3.576	90	117	156	€ 50.207.040	€ 27.244.650	€ 22.962.390
Hofplein 33	1987	14	47,9	3,4	3300	1,3	€ 3.576	90	117	28	€ 9.011.520	€ 4.917.000	€ 4.094.520
Koningin Emmaplein 7	1888	5	20,0	4,0	545	1,3	€ 4.259	113	146,9	3	€ 1.443.801	€ 812.050	€ 631.751
K.P. van der Mandelelaan 20	1990	6	20,9	3,5	2246	1,3	€ 4.026	199	258,7	8	€ 6.409.392	€ 3.346.540	€ 3.062.852
Lichtenauerlaan 122-140	2000	6	22,7	3,8	3693	1,3	€ 4.026	199	258,7	14	€ 11.216.436	€ 5.502.570	€ 5.713.866
Lichtenauerlaan 222-240	1995	4	12,4	3,1	7500	1,3	€ 4.026	199	258,7	28	€ 22.432.872	€ 11.175.000	€ 11.257.872
Marten Meesweg 8-10	1990	6	16,1	2,7	6400	1,3	€ 2.173	96	124,8	51	€ 10.639.008	€ 9.536.000	€ 1.103.008
Mathenesserlaan 145	1938	5	17,1	3,4	1141	1,3	€ 2.751	172	223,6	5	€ 2.365.860	€ 1.700.090	€ 665.770
Max Euwelaan 21-29	1989	4	14,6	3,7	2829	1,3	€ 4.026	199	258,7	10	€ 8.011.740	€ 4.215.210	€ 3.796.530
Max Euwelaan 55-57	1990	6	20,2	3,4	1191	1,3	€ 4.026	199	258,7	4	€ 3.204.696	€ 1.774.590	€ 1.430.106
Noordsingel 113-117	1882	4	15,0	3,8	6580	1,3	€ 2.667	96	124,8	52	€ 13.313.664	€ 9.804.200	€ 3.509.464
Oostmaaslaan 59-71	1974	18	61,7	3,4	17500	1,3	€ 3.228	119	154,7	113	€ 43.406.916	€ 26.075.000	€ 17.331.916
Oostplein 410-428	1993	14	45,9	3,3	4150	1,3	€ 3.185	107	139,1	29	€ 9.883.055	€ 6.183.500	€ 3.699.555
Otto Reuchlinweg 1008-1150	2005	42	143,2	3,4	6580	1,3	€ 3.185	141	183,3	35	€ 15.717.975	€ 9.804.200	€ 5.913.775
Parklaan 38	1912	3	11,5	3,8	675	1,3	€ 4.259	113	146,9	4	€ 1.925.068	€ 1.005.750	€ 919.318
Pieter de Hoochweg 111	1923	4	19,4	4,9	953	1,3	€ 2.369	98	127,4	7	€ 1.625.134	€ 1.419.970	€ 205.164
Prins Hendrikkade 12-16	1966	5	20,5	4,1	5289	1,3	€ 2.787	117	152,1	34	€ 11.086.686	€ 7.880.610	€ 3.206.076
Prins Hendrikkade 45-50	2002	6	24,2	4,0	2800	1,3	€ 2.787	117	152,1	18	€ 5.869.422	€ 4.172.000	€ 1.697.422
Provenierssingel 66	1898	3	11,6	3,9	1120	1,3	€ 2.741	121	157,3	7	€ 2.321.627	€ 1.668.800	€ 652.827
Rochussenstraat 125	1975	9	31,1	3,5	4950	1,3	€ 2.751	172	223,6	22	€ 10.409.784	€ 7.375.500	€ 3.034.284
Schiedamsedijk 77	1952	6	18,6	3,1	444	1,3	€ 3.576	90	117	3	€ 965.520	€ 661.560	€ 303.960
Schiedamse Vest 154	1954	7	23,4	3,3	2355	1,3	€ 3.576	90	117	20	€ 6.436.800	€ 3.508.950	€ 2.927.850
Schiekade 34	1946	8	25,9	3,2	8521	1,3	€ 2.866	137	178,1	47	€ 18.454.174	€ 12.696.290	€ 5.757.884
Schiekade 101	1937	4	14,0	3,5	3133	1,3	€ 2.741	121	157,3	19	€ 6.301.559	€ 4.668.170	€ 1.633.389
Schulpweg 37	1970	7	23,3	3,3	6129	1,3	€ 1.757	86	111,8	54	€ 8.159.508	€ 9.132.210	€ -972.702
s-Gravendijkwal 28-32	1976	6	19,3	3,2	3455	1,3	€ 2.751	172	223,6	15	€ 7.097.580	€ 5.147.950	€ 1.949.630
s-Gravendijkwal 68	1905	4	13,0	3,2	860	1,3	€ 2.751	172	223,6	3	€ 1.419.516	€ 1.281.400	€ 138.116
Sluisjesdijk 37	1987	4	14,7	3,7	3290	1,3	€ 1.757	86	111,8	29	€ 4.381.958	€ 4.902.100	€ -520.142
Stationsplein 45	1948	9	38,1	4,2	100000	1,3	€ 3.448	102	132,6	754	€ 265.178.784	€ 149.000.000	€ 116.178.784
Strevelsweg 700	1960	8	26,7	3,3	18600	1,3	€ 1.778	96	124,8	149	€ 25.432.512	€ 27.714.000	€ -2.281.488
Twentestraat 50-60	1990	7	22,2	3,2	2500	1,3	€ 1.851	81	105,3	23	€ 3.448.413	€ 3.725.000	€ -276.587
Vasteland 10-40	1962	9	28,7	3,2	8100	1,3	€ 3.576	90	117	69	€ 22.206.960	€ 12.069.000	€ 10.137.960
Veldkersweg 27	1983	2	6,0	3,0	1822	1,3	€ 2.833	104	135,2	13	€ 3.830.216	€ 2.714.780	€ 1.115.436
Vlasmarkt 1	1954	8	24,5	3,1	1750	1,3	€ 3.576	90	117	14	€ 4.505.760	€ 2.607.500	€ 1.898.260
Walenburgerweg 74	1972	5	17,2	3,4	630	1,3	€ 2.978	93	120,9	5	€ 1.384.770	€ 938.700	€ 446.070
Weena 70	1990	18	58,3	3,2	10688	1,3	€ 3.532	97	126,1	84	€ 28.778.736	€ 15.925.120	€ 12.853.616
Weena 200	1993	17	52,5	3,1	17600	1,3	€ 3.532	97	126,1	139	€ 47.621.956	€ 26.224.000	€ 21.397.956
Weena 325-355	1990	31	105,4	3,4	10500	1,3	€ 3.532	97	126,1	83	€ 28.436.132	€ 15.645.000	€ 12.791.132
Weena 505	1992	28	93,1	3,3	65685	1,3	€ 3.532	97	126,1	520	€ 178.154.080	€ 97.870.650	€ 80.283.430
Weena 690	2000	36	125,7	3,5	13600	1,3	€ 3.532	97	126,1	107	€ 36.658.628	€ 20.264.000	€ 16.394.628
Westblaak 5-11	1955	8	29,9	3,7	4300	1,3	€ 3.532	97	126,1	34	€ 11.648.536	€ 6.407.000	€ 5.241.536
Westblaak 180	1992	9	36,6	4,1	8470	1,3	€ 3.532	97	126,1	67	€ 22.954.468	€ 12.620.300	€ 10.334.168
Westblaak 232	1972	9	29,7	3,3	9555	1,3	€ 3.532	97	126,1	75	€ 25.695.300	€ 14.236.950	€ 11.458.350
Zuidplein 2-18	1990	10	30,4	3,0	3500	1,3	€ 1.851	81	105,3	33	€ 4.947.723	€ 5.215.000	€ -267.277
						Total	€ 196.466	6898		4774	€ 1.584.307.285	€ 923.235.290	€ 661.071.995
						Average	€ 3.169	111		77	€ 25.553.343	€ 14.890.892	€ 10.662.452

Table 30, overview of step 5, financial appraisal

Appendix 7. Transformation potential appraisal reports

Aert van Nesstraat 45; 3012CA	Building properties	Transformation potential
	Neighborhood ▪ Cool Total Floor area ▪ 24.047m² Vacancy ▪ 3.794m² – 15,78% Office rent ▪ €99,00 Residential sell price ▪ €3.532 per m² Year of construction ▪ 1976	Score ▪ 0 ▪ Class 1 Financials Units: ▪ 190 units Construction & Acquisition cost: ▪ €35.830.030 Revenue: ▪ €65.333.849 Potential Profit: ▪ **€29.264.730**

Blaak 20-40; 3011TA	Building properties	Transformation potential
	Neighborhood ▪ Stadsdriehoek Total Floor area ▪ 15.870m² Vacancy ▪ 7.116m² – 44,84% Office rent ▪ €unknown Residential sell price ▪ €3.576 Year of construction ▪ 1978	Score ▪ 0 ▪ Class: 1 Financials Units: ▪ 135 units Construction & Acquisition cost: ▪ €23.646.300 Revenue: ▪ €43.654.707 Potential Profit: ▪ **€19.802.100**

Blaak 555; 3011GB	Building properties	Transformation potential
	Neighborhood ▪ Stadsdriehoek Total Floor area ▪ 32.056m² Vacancy ▪ 17.219m² – 53,72% Office rent ▪ €unknown Residential sell price ▪ €3.576 Year of construction ▪ 1996	Score ▪ 0 ▪ Class: 1 Financials Units: ▪ 273 units Construction & Acquisition cost: ▪ €47.763.300 Revenue: ▪ €88.178.658 Potential Profit: **€40.098.880**

Boompjes 40; 3011XB	Building properties	Transformation potential
	Neighborhood ▪ Stadsdriehoek Total Floor area ▪ 40.585m² Vacancy ▪ 14.730m² – 36,29% Office rent ▪ €unknown Residential sell price ▪ €3.576 Year of construction ▪ 1988	Score ▪ 164 ▪ Class: 5 Financials Units: ▪ 346 units Construction & Acquisition cost: ▪ €60.471.650 Revenue: ▪ €111.639.969 Potential Profit: **€50.884.990**

Boompjes 250; 3011XZ	Building properties	Transformation potential
	Neighborhood ▪ Stadsdriehoek Total Floor area ▪ 9.000m² Vacancy ▪ 3.960m² – 44% Office rent ▪ €150 Residential sell price ▪ €3.576 Year of construction ▪ 1988	Score ▪ 155 ▪ Class: 4 Financials Units: ▪ 76 units Construction & Acquisition cost: ▪ €13.410.000 Revenue: ▪ €24.756.923 Potential Profit: **€11.049.840**

Boompjes 545; 3011XB

Building properties

Neighborhood
- Stadsdriehoek

Total Floor area
- 1.560m²

Vacancy
- 1.560m² – 100%

Office rent
- €unknown

Residential sell price
- €3.576

Year of construction
- 1988

Transformation potential

Score
- 158
- Class: 5

Financials
Units:
- 13 units

Construction & Acquisition cost:
- €2.324.400

Revenue:
- €4.291.200

Potential Profit:
€1.859.520

Boterdiep 46-50; 3077AW

Building properties

Neighborhood
- Oud Ijsselmonde

Total Floor area
- 1.200m²

Vacancy
- 400m² – 33,33%

Office rent
- €130

Residential sell price
- €2.375

Year of construction
- 1986

Transformation potential

Score
- 166
- Class: 5

Financials
Units:
- 8 units

Construction & Acquisition cost:
- €1.788.000

Revenue:
- €2.192.307

Potential Profit:
€283.000

Brielselaan 85; 3081AB

Building properties

Neighborhood
- Tarwewijk

Total Floor area
- 1.900m²

Vacancy
- 900m² – 47,37%

Office rent
- €90

Residential sell price
- €1.654

Year of construction
- 1953

Transformation potential

Score
- 0
- Class: 1

Financials
Units:
- 17 units

Construction & Acquisition cost:
- €2.831.000

Revenue:
- €2.417.384

Potential Profit:
-€440.970

Coolhaven 236-238; 3024AN

Building properties

Neighborhood
- Delfshaven

Total Floor area
- 1.098m²

Vacancy
- 507m² – 46,17%

Office rent
- €unknown

Residential sell price
- €2.369

Year of construction
- 1942

Transformation potential

Score
- 133
- Class: 1

Financials
Units:
- 8 units

Construction & Acquisition cost:
- €1.636.020

Revenue:
- €2.000.893

Potential Profit:
€221.276

Coolsingel 120; 3011AG

Building properties

Neighborhood
- Cool

Total Floor area
- 21.309m²

Vacancy
- 19.020m² – 89,26%

Office rent
- €unknown

Residential sell price
- €3.532

Year of construction
- 1991

Transformation potential

Score
- 0
- Class: 1

Financials
Units:
- 166 units

Construction & Acquisition cost:
- €31.750.410

Revenue:
- €57.894.913

Potential Profit:
€25.807.062

Coolsingel 139; 3012 AG	Building properties	Transformation potential
	Neighborhood ▪ Cool Total Floor area ▪ 24.062m² Vacancy ▪ 4.628m² – 19,23% Office rent ▪ €155 Residential sell price ▪ €3.532 Year of construction ▪ 1978	Score ▪ 139 ▪ Class: 1 Financials Units: ▪ 190 units Construction & Acquisition cost: ▪ €35.852.380 Revenue: ▪ €65.374.603 Potential Profit: **€29.242.380**

Delftseplein 30-33; 3013AA	Building properties	Transformation potential
	Neighborhood ▪ CS Kwartier Total Floor area ▪ 7.061m² Vacancy ▪ 1.315m² – 18,62% Office rent ▪ €195 Residential sell price ▪ €3.448 Year of construction ▪ 1959	Score ▪ 0 ▪ Class: 1 Financials Units: ▪ 53 units Construction & Acquisition cost: ▪ €10.520.890 Revenue: ▪ €18.727.944 Potential Profit: **€8.118.998**

Glashaven 8-10; 3011XH	Building properties	Transformation potential
	Neighborhood ▪ Stadsdriehoek Total Floor area ▪ 2.140m² Vacancy ▪ 2.140m² – 100% Office rent ▪ €unknown Residential sell price ▪ €3.576 Year of construction ▪ 1959	Score ▪ 144 ▪ Class: 4 Financials Units: ▪ 18 units Construction & Acquisition cost: ▪ €3.188.600 Revenue: ▪ €5.886.646 Potential Profit: **€2.604.520**

Glashaven 16-70; 3011XJ	Building properties	Transformation potential
	Neighborhood ▪ Stadsdriehoek Total Floor area ▪ 6.200m² Vacancy ▪ 1.115m² – 17,98% Office rent ▪ €unknown Residential sell price ▪ €3.576 Year of construction ▪ 1959	Score ▪ 158 ▪ Class: 5 Financials Units: ▪ 53 units Construction & Acquisition cost: ▪ €9.238.000 Revenue: ▪ €17.054.769 Potential Profit: **€7.497.680**

Goudsesingel 66-202	Building properties	Transformation potential
	Neighborhood ▪ Stadsdriehoek Total Floor area ▪ 22.405m² Vacancy ▪ 22.405m² – 100% Office rent ▪ €unknown Residential sell price ▪ €3.576 Year of construction ▪ 1950	Score ▪ 143 ▪ Class: 4 Financials Units: ▪ 191 units Construction & Acquisition cost: ▪ €33.383.450 Revenue: ▪ €61.630.984 Potential Profit: **€28.087.990**

Goudsesingel 230	Building properties	Transformation potential
	Neighborhood ▪ Stadsdriehoek Total Floor area ▪ 1.391m² Vacancy ▪ 1.391m² – 100% Office rent ▪ €unknown Residential sell price ▪ €3.576 Year of construction ▪ 1949	Score ▪ 153 ▪ Class: 4 Financials Units: ▪ 12 units Construction & Acquisition cost: ▪ €2.072.590 Revenue: ▪ €3.826.320 Potential Profit: **€1.467.650**

Groene Tuin 277-299; 3078KG	Building properties	Transformation potential
	Neighborhood ▪ Groot Ijsselmonde Noord Total Floor area ▪ 3.228m² Vacancy ▪ 2.343m² – 72,58% Office rent ▪ €unknown Residential sell price ▪ €1.918 Year of construction ▪ 1992	Score ▪ 162 ▪ Class: 5 Financials Units: ▪ 28 units Construction & Acquisition cost: ▪ €4.809.720 Revenue: ▪ €4.762.541 Potential Profit: **-€200.766**

Hang 6; 3011GG	Building properties	Transformation potential
	Neighborhood ▪ Stadsdriehoek Total Floor area ▪ 1.295m² Vacancy ▪ 1.295m² – 100% Office rent ▪ €unknown Residential sell price ▪ €3.576 Year of construction ▪ 1950	Score ▪ 141 ▪ Class: 4 Financials Units: ▪ 11 units Construction & Acquisition cost: ▪ €1.929.550 Revenue: ▪ €3.562.245 Potential Profit: **€1.610.690**

Hofplein 20; 3032AC	Building properties	Transformation potential
	Neighborhood ▪ Stadsdriehoek Total Floor area ▪ 18.285m² Vacancy ▪ 15.089m² – 82,52% Office rent ▪ €270 Residential sell price ▪ €3.576 Year of construction ▪ 1995	Score ▪ 158 ▪ Class: 5 Financials Units: ▪ 156 units Construction & Acquisition cost: ▪ €27.244.650 Revenue: ▪ €50.297.815 Potential Profit: **€22.962.390**

Hofplein 33; 3011AJ	Building properties	Transformation potential
	Neighborhood ▪ Stadsdriehoek Total Floor area ▪ 3.300m² Vacancy ▪ 2.062m² – 62,48% Office rent ▪ €165 Residential sell price ▪ €3.576 Year of construction ▪ 1987	Score ▪ 147 ▪ Class: 4 Financials Units: ▪ 28 units Construction & Acquisition cost: ▪ €4.917.000 Revenue: ▪ €9.077.538 Potential Profit: **€4.094.520**

Koningin Emmaplein 7; 3016AA	Building properties	Transformation potential
	Neighborhood ▪ Nieuwe Werk-Dijkzigt Total Floor area ▪ 545m² Vacancy ▪ 545m² – 100% Office rent ▪ €unknown Residential sell price ▪ €4.259 Year of construction ▪ 1888	Score ▪ 137 ▪ Class: 4 Financials Units: ▪ 4 units Construction & Acquisition cost: ▪ €812.050 Revenue: ▪ €1.785.503 Potential Profit: **€631.751**

K.P. v/d Mandelelaan 20; 3062MB	Building properties	Transformation potential
	Neighborhood ▪ Kralingen Oost Total Floor area ▪ 2.246m² Vacancy ▪ 2.012m² – 89,58% Office rent ▪ €unknown Residential sell price ▪ €4.026 Year of construction ▪ 1988	Score ▪ 144 ▪ Class: 4 Financials Units: ▪ 9 units Construction & Acquisition cost: ▪ €3.346.540 Revenue: ▪ €6.955.689 Potential Profit: **€3.062.852**

Lichtenauerlaan 122-140; 3062ME	Building properties	Transformation potential
	Neighborhood ▪ Kralingen Oost Total Floor area ▪ 3.693m² Vacancy ▪ 1.929m² – 52,23% Office rent ▪ €165 Residential sell price ▪ €4.026 Year of construction ▪ 2000	Score ▪ 0 ▪ Class: 1 Financials Units: ▪ 14 units Construction & Acquisition cost: ▪ €5.502.570 Revenue: ▪ €11.436.936 Potential Profit: **€5.713.866**

Lichtenauerlaan 222-240; 3062ME	Building properties	Transformation potential
	Neighborhood ▪ Kralingen Oost Total Floor area ▪ 7.500m² Vacancy ▪ 2.149m² – 28,65% Office rent ▪ €165 Residential sell price ▪ €4.026 Year of construction ▪ 1995	Score ▪ 0 ▪ Class: 1 Financials Units: ▪ 29 units Construction & Acquisition cost: ▪ €11.175.000 Revenue: ▪ €23.226.923 Potential Profit: **€11.257.872**

Marten Meesweg 8-10; 3068AV	Building properties	Transformation potential
	Neighborhood ▪ Oosterflank Total Floor area ▪ 6.400m² Vacancy ▪ 4.000m² – 62,5% Office rent ▪ €unknown Residential sell price ▪ €2.173 Year of construction ▪ 1990	Score ▪ 0 ▪ Class: 1 Financials Units: ▪ 51 units Construction & Acquisition cost: ▪ €9.536.000 Revenue: ▪ €10.697.846 Potential Profit: **€1.103.008**

Mathenesserlaan 145; 3015CJ	Building properties	Transformation potential
	Neighborhood ▪ Oude Westen Total Floor area ▪ 1.141m² Vacancy ▪ 1.043m² – 91,41% Office rent ▪ €unknown Residential sell price ▪ €2.751 Year of construction ▪ 1938	Score ▪ 136 ▪ Class: 4 Financials Units: ▪ 5 units Construction & Acquisition cost: ▪ €1.700.090 Revenue: ▪ €2.414.531 Potential Profit: **€665.770**

Max Euwelaan 21-29; 3062MA	Building properties	Transformation potential
	Neighborhood ▪ Kralingen Oost Total Floor area ▪ 2.829m² Vacancy ▪ 2.239m² – 79,14% Office rent ▪ €unknown Residential sell price ▪ €4.026 Year of construction ▪ 1989	Score ▪ 0 ▪ Class: 1 Financials Units: ▪ 11 units Construction & Acquisition cost: ▪ €4.215.210 Revenue: ▪ €8.761.195 Potential Profit: **€3.796.530**

Max Euwelaan 55-57; 3062 MA	Building properties	Transformation potential
	Neighborhood ▪ Kralingen Oost Total Floor area ▪ 1.191m² Vacancy ▪ 634m² – 53,23% Office rent ▪ €145 Residential sell price ▪ €4.026 Year of construction ▪ 1990	Score ▪ 0 ▪ Class: 1 Financials Units: ▪ 5 units Construction & Acquisition cost: ▪ €1.774.590 Revenue: ▪ €3.688.435 Potential Profit: **€1.430.106**

Noordsingel 113-117; 3035EM	Building properties	Transformation potential
	Neighborhood ▪ Oude Noorden Total Floor area ▪ 6.580m² Vacancy ▪ 765m² – 11,63% Office rent ▪ €75 Residential sell price ▪ €2.667 Year of construction ▪ 1882	Score ▪ 133 ▪ Class: 4 Financials Units: ▪ 53 units Construction & Acquisition cost: ▪ €9.804.200 Revenue: ▪ €13.499.123 Potential Profit: **€3.509.464**

Oostmaaslaan 59-71; 3063AN	Building properties	Transformation potential
	Neighborhood ▪ Struisenburg Total Floor area ▪ 17.500m² Vacancy ▪ 16.875m² – 96,43% Office rent ▪ €165 Residential sell price ▪ €3.228 Year of construction ▪ 1974	Score ▪ 142 ▪ Class: 4 Financials Units: ▪ 113 units Construction & Acquisition cost: ▪ €26.075.000 Revenue: ▪ €43.453.846 Potential Profit: **€17.331.916**

Oostplein 410-428; 3061CH	Building properties	Transformation potential
	Neighborhood ▪ Kralingen West Total Floor area ▪ 4.150m^2 Vacancy ▪ 1.057m^2 – 25,47% Office rent ▪ €125 Residential sell price ▪ €3.185 Year of construction ▪ 1993	Score ▪ 145 ▪ Class: 4 Financials Units: ▪ 30 units Construction & Acquisition cost: ▪ €6.183.500 Revenue: ▪ €10.167.500 Potential Profit: **€3.699.555**

Otto Reuchlingweg 1008-1150; 3072MD	Building properties	Transformation potential
	Neighborhood ▪ Kop van Zuid Total Floor area ▪ 6.580m^2 Vacancy ▪ 1.699m^2 – 25,82% Office rent ▪ €165 Residential sell price ▪ €3.185 Year of construction ▪ 2005	Score ▪ 0 ▪ Class: 1 Financials Units: ▪ 36 units Construction & Acquisition cost: ▪ €9.804.200 Revenue: ▪ €16.121.000 Potential Profit: **€5.913.775**

Parklaan 38; 3016BC	Building properties	Transformation potential
	Neighborhood ▪ Nieuwe Werk-Dijkzigt Total Floor area ▪ 675m^2 Vacancy ▪ 675m^2 – 100% Office rent ▪ €200 Residential sell price ▪ €4.259 Year of construction ▪ 1912	Score ▪ 146 ▪ Class: 4 Financials Units: ▪ 4 units Construction & Acquisition cost: ▪ €1.005.750 Revenue: ▪ €2.211.403 Potential Profit: **€919.318**

Pieter de Hoochweg 111; 3024BG	Building properties	Transformation potential
	Neighborhood ▪ Delfshaven Total Floor area ▪ 953m^2 Vacancy ▪ 430m^2 – 45,12% Office rent ▪ €135 Residential sell price ▪ €2.369 Year of construction ▪ 1923	Score ▪ 147 ▪ Class: 4 Financials Units: ▪ 7 units Construction & Acquisition cost: ▪ €1.419.970 Revenue: ▪ €1.736.659 Potential Profit: **€205.164**

Prins Hendrikkade 12-16; 3071KB	Building properties	Transformation potential
	Neighborhood ▪ Noordereiland Total Floor area ▪ 5.289m^2 Vacancy ▪ 4.686m^2 – 88,6% Office rent ▪ €unknown Residential sell price ▪ €2.787 Year of construction ▪ 1966	Score ▪ 154 ▪ Class: 4 Financials Units: ▪ 34 units Construction & Acquisition cost: ▪ €7.880.610 Revenue: ▪ €11.338.802 Potential Profit: **€3.206.076**

Prins Hendrikkade 45-50;3071KB	Building properties	Transformation potential
	Neighborhood ▪ Noordereiland Total Floor area ▪ 2.800m^2 Vacancy ▪ 1.115m^2 – 39,82% Office rent ▪ €unknown Residential sell price ▪ €2.787 Year of construction ▪ 2002	Score ▪ 141 ▪ Class: 4 Financials Units: ▪ 18 units Construction & Acquisition cost: ▪ €4.172.000 Revenue: ▪ €6.002.769 Potential Profit: **€1.697.422**

Provenierssingel 66; 3033EN	Building properties	Transformation potential
	Neighborhood ▪ Provenierswijk Total Floor area ▪ 1.120m^2 Vacancy ▪ 515m^2 – 45,98% Office rent ▪ €unknown Residential sell price ▪ €2.741 Year of construction ▪ 1898	Score ▪ 151 ▪ Class: 4 Financials Units: ▪ 7 units Construction & Acquisition cost: ▪ €1.668.800 Revenue: ▪ €2.361.476 Potential Profit: **€652.827**

Rochussenstraat 125; 3015EJ	Building properties	Transformation potential
	Neighborhood ▪ Oude Westen Total Floor area ▪ 4.950m^2 Vacancy ▪ 1.032m^2 – 20,85% Office rent ▪ €unknown Residential sell price ▪ €2.751 Year of construction ▪ 1975	Score ▪ 140 ▪ Class: 4 Financials Units: ▪ 22 units Construction & Acquisition cost: ▪ €7.375.500 Revenue: ▪ €10.474.961 Potential Profit: **€3.034.284**

Schiedamsedijk 77; 3011EM	Building properties	Transformation potential
	Neighborhood ▪ Stadsdriehoek Total Floor area ▪ 444m^2 Vacancy ▪ 390m^2 – 87,84% Office rent ▪ €unknown Residential sell price ▪ €3.576 Year of construction ▪ 1952	Score ▪ 122 ▪ Class: 4 Financials Units: ▪ 3 units Construction & Acquisition cost: ▪ €661.560 Revenue: ▪ €1.221.341 Potential Profit: **€303.960**

SchiedamseVest 154;3011BH	Building properties	Transformation potential
	Neighborhood ▪ Stadsdriehoek Total Floor area ▪ 2.355m^2 Vacancy ▪ 1.685m^2 – 71,55% Office rent ▪ €unknown Residential sell price ▪ €3.576 Year of construction ▪ 1954	Score ▪ 141 ▪ Class: 4 Financials Units: ▪ 20 units Construction & Acquisition cost: ▪ €3.508.950 Revenue: ▪ €6.478.061 Potential Profit: **€2.927.850**

Schiekade 34; 3032AJ	Building properties	Transformation potential
	Neighborhood ▪ Agniesebuurt Total Floor area ▪ 8.521m² Vacancy ▪ 2.293m² – 26,91% Office rent ▪ €unknown Residential sell price ▪ €2.866 Year of construction ▪ 1946	Score ▪ 150 ▪ Class: 4 Financials Units: ▪ 47 units Construction & Acquisition cost: ▪ €12.969.290 Revenue: ▪ €18.785.527 Potential Profit: **€5.757.884**

Schiekade 101; 3033BG	Building properties	Transformation potential
	Neighborhood ▪ Provenierswijk Total Floor area ▪ 3.133m² Vacancy ▪ 1.473m² – 47,02% Office rent ▪ €unknown Residential sell price ▪ €2.741 Year of construction ▪ 1937	Score ▪ 160 ▪ Class: 4 Financials Units: ▪ 20 units Construction & Acquisition cost: ▪ €4.668.170 Revenue: ▪ €6.605.810 Potential Profit: **€1.633.389**

Schulpweg 37; 3084NG	Building properties	Transformation potential
	Neighborhood ▪ Oud Charlois Total Floor area ▪ 6.129m² Vacancy ▪ 3.400m² – 55,47% Office rent ▪ €unknown Residential sell price ▪ €1.757 Year of construction ▪ 1970	Score ▪ 143 ▪ Class: 4 Financials Units: ▪ 54 units Construction & Acquisition cost: ▪ €9.132.210 Revenue: ▪ €8.283.579 Potential Profit: **-€972.702**

‘s Gravendijkwal 28-32; 3014EC	Building properties	Transformation potential
	Neighborhood ▪ Oude Westen Total Floor area ▪ 3.455m² Vacancy ▪ 977m² – 28,28% Office rent ▪ €unknown Residential sell price ▪ €2.751 Year of construction ▪ 1976	Score ▪ 136 ▪ Class: 4 Financials Units: ▪ 15 units Construction & Acquisition cost: ▪ €5.147.950 Revenue: ▪ €7.311.311 Potential Profit: **€1.949.630**

‘s Gravendijkwal 68; 3014EG	Building properties	Transformation potential
	Neighborhood ▪ Oude Westen Total Floor area ▪ 860m² Vacancy ▪ 860m² – 100% Office rent ▪ €unknown Residential sell price ▪ €2.751 Year of construction ▪ 1905	Score ▪ 135 ▪ Class: 4 Financials Units: ▪ 4 units Construction & Acquisition cost: ▪ €1.281.400 Revenue: ▪ €1.819.892 Potential Profit: **€138.116**

Sluisjesdijk 37; 3087AD	Building properties	Transformation potential
	Neighborhood ▪ Oud Charlois Total Floor area ▪ 3.290m² Vacancy ▪ 1.268m² – 38,54% Office rent ▪ €unknown Residential sell price ▪ €1.757 Year of construction ▪ 1987	Score ▪ 0 ▪ Class: 1 Financials Units: ▪ 29 units Construction & Acquisition cost: ▪ €4.902.100 Revenue: ▪ €4.446.561 Potential Profit: **-€520.142**

Stationsplein 45; 3013AK	Building properties	Transformation potential
	Neighborhood ▪ CS Kwartier Total Floor area ▪ 100.000m² Vacancy ▪ 5.510m² – 5,51% Office rent ▪ €unknown Residential sell price ▪ €3.448 Year of construction ▪ 1948	Score ▪ 0 ▪ Class: 1 Financials Units: ▪ 754 units Construction & Acquisition cost: ▪ €149.000.000 Revenue: ▪ €265.230.769 Potential Profit: **€116.178.784**

Strevelsweg 700; 3083AS	Building properties	Transformation potential
	Neighborhood ▪ Vreewijk Total Floor area ▪ 18.600m² Vacancy ▪ 350m² – 1,88% Office rent ▪ €unknown Residential sell price ▪ €1.778 Year of construction ▪ 1960	Score ▪ 144 ▪ Class: 4 Financials Units: ▪ 149 units Construction & Acquisition cost: ▪ €27.714.000 Revenue: ▪ €25.439.076 Potential Profit: **-€2.281.488**

Twentestraat 50-60; 3083BD	Building properties	Transformation potential
	Neighborhood ▪ Zuidplein Total Floor area ▪ 2.500m² Vacancy ▪ 2.231m² – 89,24% Office rent ▪ €120 Residential sell price ▪ €1.851 Year of construction ▪ 1990	Score ▪ 159 ▪ Class: 4 Financials Units: ▪ 23 units Construction & Acquisition cost: ▪ €3.725.000 Revenue: ▪ €3.559.615 Potential Profit: **-€276.587**

Vasteland 10-40; 3011BL	Building properties	Transformation potential
	Neighborhood ▪ Stadsdriehoek Total Floor area ▪ 8.100m² Vacancy ▪ 4.423m² – 54,60% Office rent ▪ €165 Residential sell price ▪ €3.576 Year of construction ▪ 1962	Score ▪ 150 ▪ Class: 4 Financials Units: ▪ 69 units Construction & Acquisition cost: ▪ €12.069.000 Revenue: ▪ €22.281.230 Potential Profit: **€10.137.960**

Veldkersweg 27; 3053JR	Building properties	Transformation potential
	Neighborhood ▪ Schiebroek Total Floor area ▪ 40.585m² Vacancy ▪ 14.730m² – 36,29% Office rent ▪ €unknown Residential sell price ▪ €2.833 Year of construction ▪ 1988	Score ▪ 150 ▪ Class: 4 Financials Units: ▪ 13 units Construction & Acquisition cost: ▪ €2.714.780 Revenue: ▪ €3.970.558 Potential Profit: **€1.115.436**

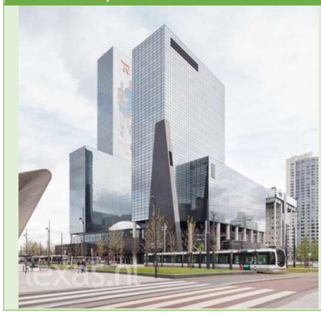
Vlasmarkt 1; 3011PW	Building properties	Transformation potential
	Neighborhood ▪ Stadsdriehoek Total Floor area ▪ 1.750m² Vacancy ▪ 926m² – 52,91% Office rent ▪ €135 Residential sell price ▪ €3.576 Year of construction ▪ 1954	Score ▪ 139 ▪ Class: 4 Financials Units: ▪ 14 units Construction & Acquisition cost: ▪ €2.307.500 Revenue: ▪ €4.813.846 Potential Profit: **€1.898.260**

Walenburgerweg 74; 3033AG	Building properties	Transformation potential
	Neighborhood ▪ Blijdorp Total Floor area ▪ 630m² Vacancy ▪ 160m² – 25,40% Office rent ▪ €u115 Residential sell price ▪ €2.978 Year of construction ▪ 1972	Score ▪ 138 ▪ Class: 4 Financials Units: ▪ 5 units Construction & Acquisition cost: ▪ €938.700 Revenue: ▪ €1.443.184 Potential Profit: **€446.070**

Weena 70; 3012CM	Building properties	Transformation potential
	Neighborhood ▪ Cool Total Floor area ▪ 10.688m² Vacancy ▪ 3.809m² – 35,64% Office rent ▪ €unknown Residential sell price ▪ €3.532 Year of construction ▪ 1990	Score ▪ 0 ▪ Class: 1 Financials Units: ▪ 84 units Construction & Acquisition cost: ▪ €15.925.120 Revenue: ▪ €29.038.473 Potential Profit: **€12.853.616**

Weena 200; 3012NJ	Building properties	Transformation potential
	Neighborhood ▪ Cool Total Floor area ▪ 17.600m² Vacancy ▪ 4.069m² – 23,12% Office rent ▪ €175 Residential sell price ▪ €3.532 Year of construction ▪ 1993	Score ▪ 0 ▪ Class: 1 Financials Units: ▪ 139 units Construction & Acquisition cost: ▪ €26.224.000 Revenue: ▪ €47.817.846 Potential Profit: **€21.397.956**

Weena 325-355; 3013AJ	Building properties	Transformation potential
	Neighborhood ▪ Cool Total Floor area ▪ 10.500m^2 Vacancy ▪ 1.904m^2 – 18,13% Office rent ▪ €unknown Residential sell price ▪ €3.532 Year of construction ▪ 1990	Score ▪ 0 ▪ Class: 1 Financials Units: ■ 83units Construction & Acquisition cost: ▪ €15.645.000 Revenue: ▪ €28.527.692 Potential Profit: **€12.791.132**

Weena 505; 3013AL	Building properties	Transformation potential
	Neighborhood ▪ Cool Total Floor area ▪ 65685m^2 Vacancy ▪ 27.507m^2 – 41,88% Office rent ▪ €190 Residential sell price ▪ €3.532 Year of construction ▪ 1992	Score ▪ 0 ▪ Class: 1 Financials Units: ■ 520 units Construction & Acquisition cost: ▪ €97.870.650 Revenue: ▪ €178.461.092 Potential Profit: **€80.283.430**

Weena 690; 3012CN	Building properties	Transformation potential
	Neighborhood ▪ Cool Total Floor area ▪ 13.600m^2 Vacancy ▪ 9.024m^2 – 66,35% Office rent ▪ €unknown Residential sell price ▪ €3.532 Year of construction ▪ 2000	Score ▪ 0 ▪ Class: 1 Financials Units: ■ 107 units Construction & Acquisition cost: ▪ €20.265.650 Revenue: ▪ €36.950.153 Potential Profit: **€16.394.628**

Westblaak 5-11; 3012KC	Building properties	Transformation potential
	Neighborhood ▪ Cool Total Floor area ▪ 4.300m^2 Vacancy ▪ 577m^2 – 13,42% Office rent ▪ €unknown Residential sell price ▪ €3.532 Year of construction ▪ 1955	Score ▪ 0 ▪ Class: 1 Financials Units: ■ 34 units Construction & Acquisition cost: ▪ €6.407.000 Revenue: ▪ €11.682.769 Potential Profit: **€5.241.536**

Westblaak 180; 3012KN	Building properties	Transformation potential
	Neighborhood ▪ Cool Total Floor area ▪ 8.470m^2 Vacancy ▪ 3.295m^2 – 38,90% Office rent ▪ €145 Residential sell price ▪ €3.532 Year of construction ▪ 1992	Score ▪ 0 ▪ Class: 1 Financials Units: ■ 67 units Construction & Acquisition cost: ▪ €12.620.300 Revenue: ▪ €23.012.338 Potential Profit: **€10.334.168**

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Westblaak 232; 3012KN	Building properties	Transformation potential
	Neighborhood ▪ CCool Total Floor area ▪ 9.555m^2 Vacancy ▪ 2.302m^2 – 24,09% Office rent ▪ €145 Residential sell price ▪ €3.532 Year of construction ▪ 1972	Score ▪ 0 ▪ Class: 1 Financials Units: ▪ 75 units Construction & Acquisition cost: ▪ €14.236.950 Revenue: ▪ €25.960.200 Potential Profit: **€11.458.350**

Zuidplein 2-18; 3083CW	Building properties	Transformation potential
	Neighborhood ▪ Zuidplein Total Floor area ▪ 3.500m^2 Vacancy ▪ 2.158m^2 – 61,66% Office rent ▪ €125 Residential sell price ▪ €1.851 Year of construction ▪ 1990	Score ▪ 157 ▪ Class: 4 Financials Units: ▪ 33 units Construction & Acquisition cost: ▪ €5.215.000 Revenue: ▪ €4.983.461 Potential Profit: **-€267.277**