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DOI
10.1002/9781119231455.ch7

Publication date
2018

Document Version
Accepted author manuscript

Published in
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TU Delft, March 29 2017

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Abstract

Building owners and other stakeholders can adopt different strategies to cope with vacancy, such as consolidation, rent reduction, selling the building, renovation, transformation and conversion to adapted reuse, or demolish and build a new building. This chapter discusses various tools to cope with vacancy by adaptive reuse. It presents an overview of the many factors and aspects that enable or hinder adaptive reuse by conversion of (office) buildings into housing, and how to assess the characteristics of the market, location, building and involved stakeholders. Furthermore, it presents the Conversion Meter, a tool to assess the conversion potential of vacant office buildings into housing. The tool is built up from a first quick scan using veto criteria (Step 1) till a more detailed scan of the conversion potential based on gradual criteria (Step 2). No single gradual criterion is sufficient to decide if conversion is possible or not; it is the combination of all criteria i.e. the sum that provides a valuable indicator for the conversion potential. Step 3 calculates a conversion potential score as a weighted sum of all criteria. Step 4 is a scan on financial feasibility. The final Step 5 is a check on possible risks and opportunities to eliminate these risks. The chapter continues with lessons learned from case studies by applying the Conversion Meter.

Key words
Adaptive reuse, transformation, conversion meter, assessment tools, vacant buildings, risks, opportunities

8.1 Introduction: why adaptive reuse?

Property owners have various possible strategies for dealing with vacant office buildings: consolidation, rent reduction to retain current tenants or to attract new tenants, selling the building, renovation or upgrading, demolition and new-build, and conversion to new functions (Remøy, 2014). Most owners choose consolidation i.e. keep the building as it is, search for new tenants and wait for better times. Mothballing a building or temporarily allowing use for anti-squat are usually not permanent solutions for coping with structural vacancy but may precede renovation, redevelopment and conversion. Mothballing and anti-squat may both result in damage to the building and make repair and redecorations necessary before the building can be rented. Lowering rent can attract tenants, but is no structural solution in a real estate market with a supply being higher than the demand for the current function. Selling is often not an option either. The value of office buildings is based on the potential rental yield and hence the sale of a vacant building often yields less than its book value. Most owners are not willing to accept this financial loss. Likewise, new investments for renovation or upgrading the building are difficult to explain to investors who already lost money on a property. Though smaller renovations are performed every 5 years (Douglas, 2006; Vijverberg, 2001) at some point the building requires major adaptations (Wilkinson and Remøy, 2011). In markets with high vacancy levels, there is a risk that the benefits of upgrading the building for continuation of the current function will be less than the intervention costs. Demolition and new-build creates possibilities for a good fit with current and future users' needs. However, redevelopment takes time and causes interruptions to income streams. If the building is technically in a good state, redevelopment is a waste of resources and conflicts with global aims for sustainable development. If the building has a particular cultural or historical value or adds value to the identity of the location or a wider area, demolishment is not an appropriate strategy either. Conversion to new use may be a more appropriate approach. Conversion may sustain a beneficial and durable use of the location and building, implies less income disruption than redevelopment and can have high social and financial benefits (Bullen, 2011). However, conversion may be expensive and requires the willingness of various stakeholders to adapt the building for other functions. Besides, the future market value of accommodating a new function must be higher than for continuing to use it for the same function.

So, an important question is: which factors may enable successful conversion to other functions, which factors are hindering adaptive reuse, what are the main opportunities and risks, and how can these risks be reduced or eliminated? In section 2 we first present an overview of relevant factors and aspects. Section 3 presents an assessment tool to assess the opportunities and risks of conversion of office buildings to housing: the Conversion Potential Meter, abbreviated as the Conversion Meter. This tool is illustrated with case studies. Section 4 presents important opportunities and risks found in 15 Dutch cases. Finally, section 5 presents concluding remarks related to resilience and how to prevent high levels of vacancy in the future.

8.2 Opportunities and risks

The most appropriate strategy to cope with vacancy depends on the current and future real estate market (demand and supply), the characteristics of the location, the characteristics of the building or a portfolio with a number of buildings, and the interests, preferences and prerequisites of various stakeholders. These factors have a large impact on the conversion potential of a (vacant) building and opportunities and risks of conversion to other functions. Relevant aspects to be taken into account are functional aspects, cultural aspects (aesthetics, architectural-, cultural- or historical value), technical aspects, legal aspects and financial aspects (Geraedts, 2003, Geraedts, 2007, Remøy, 2011, Remøy, 2014). All these factors and aspects may have an impact on the opportunities and risks of conversion and sustainable adaptive reuse of (office) buildings. They are all relevant to assess the conversion potential of a particular building, a real estate portfolio, or sustainable area transformations of for instance inner cities, suburbs or brownfields (see Figure 8.1).

Figure 8.1: Factors that may influence the strategy to cope with vacancy

Levels ➡ Factors ⬇	Market	Stakeholders	Location	Building
Functional				
Cultural				
Technical				
Legal				
Financial				

The matrix in Figure 8.1 can be used as an overall framework to assess different strategies to cope with vacancy. Next, we discuss the four levels – market, location, building and stakeholders - more generally and where appropriate discuss the impact of the 5 factors.

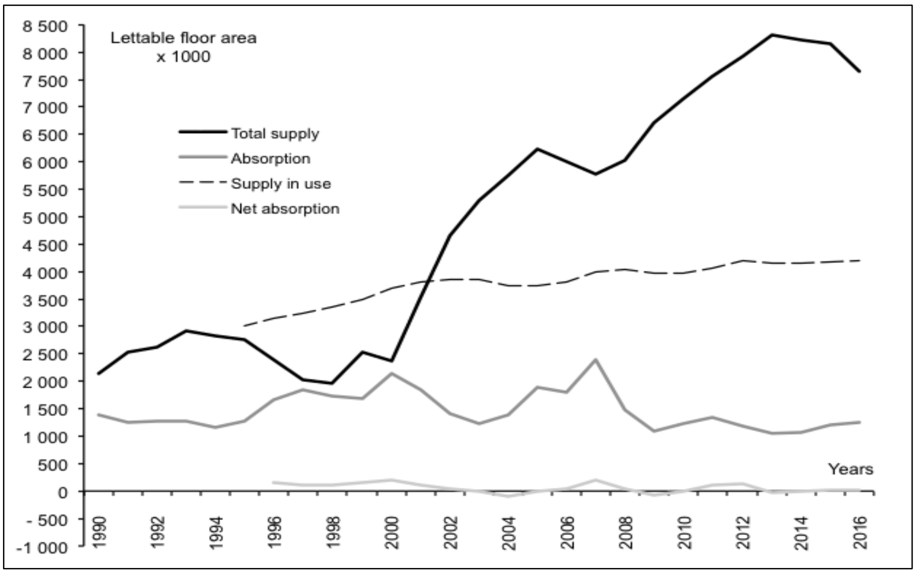
8.2.1 Market potential: opportunities and risks

Adaptive reuse is an option to cope with vacancy in case of:
- An oversupply of vacant buildings i.e. the level and duration of vacancy are high, and are expected to be high in the future as well;
- Sufficient demand for new functions;
- The costs and finance possibilities of adaptive reuse i.e. the return on investment is sufficient to stimulate property owners or other parties to invest in buying a vacant building and convert it to a new function.

Level and duration of vacancy

The longer a building has been vacant, the more likely it is that continuation of its current function is not viable and adaptive reuse may be a more successful strategy. A vacancy level of 4-5% is perceived as necessary to enable companies to move (Keeris, 2007). During the movement of the end user to another building the current building will be vacant for a while, the so-called 'frictional' vacancy. However, when too many buildings are structurally vacant i.e. are vacant for over three years this is an indication of a serious quantitative and/or qualitative misfit between demand and supply. Figure 8.2 shows the vacancy rate of office buildings in the Netherlands in the past twenty years.

Figure 8.2: Vacancy levels in the Netherlands, 1995-2016



(Source: Soeter, J. and Remoy, H., 2016)

It is expected that although the financial crisis of the late 2000s seems over most vacancy will not disappear. Due to news ways of working, ageing populations and the outsourcing of services to low-income countries, most of the current office supply will not be picked up by the market. Whereas new buildings are quite popular, they drive out older buildings at the lower end of the office market. In the Netherlands, structural vacancy is most frequent in office buildings built between 1980 and 1985 (Remøy, 2010). This can be explained by the generally sombre appearance of these buildings, as well as by the fact that they have become obsolete from a technical and functional viewpoint. In order to be able to predict the vacancy risk of a particular building, Geraedts and Van der Voordt (2003) developed the so-called *vacancy-risk meter* to define the lower end of the office market. Factors that increase the risk of vacancy such as a poor location, insufficient parking facilities, limited accessibility by car or public transport or a poor technical condition plea for an intervention. Moreover, the same factors may hinder adaptive reuse because costly improvements will be necessary.

Table 8.1: Relevant aspects on the demand side of residential accommodation

Location (housing environment)	Building (residential)	
1. Atmosphere	1. Dwelling type	9. General conditions
a. Nature of built environment	2. Access	a. Accessibility
b. Social image	3. Dwelling size	b. Safety
c. Liveliness	a. Number of rooms	c. Flexibility
d. Available green space	b. Living room	d. Adequate management
2. Facilities	c. Kitchen	10. Costs
a. Shops	d. Bedrooms	a. Purchase price/rent
b. Restaurants, bars, etc.	e. Sanitary facilities	b. Other costs
c. Schools	f. Storage space	
d. Bank/Post office	4. Arrangement of dwelling	
e. Medical facilities	5. Level of facilities	
f. Recreative facilities	6. Outside space (garden, etc.)	
3. Accessibility public transport	7. View from dwelling, privacy	
a. Distance to bus stop	8. Environmental aspects	
b. Frequency and times	a. Heating	
c. Distance to tram/underground	b. Ventilation	
4. Accessibility by car	c. Noise	
a. Distance to motorway	d. Exposure to sun/daylight	
b. Congestion level	e. Energy consumption	
c. Parking facilities	f. Materials used	

(Source: ??)

Demand for new functions

Without sufficient demand for other functions adaptive reuse will not be successful. So, it is important to assess the demand for space of prospective target groups and their needs and preferences. Table 8.1 shows a number of relevant characteristics of the location and the building that should be taken into account in case of conversions of vacant buildings into housing. On a more detailed level, it is relevant to make a distinction between sub-groups such as students, starters, young families, young urban professionals, and elderly people. These sub-groups have different demands regarding costs and quality, due to the different phases in life and different income levels that affect the affordable rent level or purchase price. In cities with many students and other young people conversion into low-cost accommodation may be a good choice. In case of high-rise office buildings, conversion into accommodation for seniors and families can be noticed as an increasing (international) development in large cities. Market research to define the particular demand for dwellings may help to define which conversion is most appropriate to meet the needs and preferences of potential target groups.

Costs and return on investment

Current and expected future vacancy levels may have an impact on rent levels and the financial value of the building. The appraised market value of office buildings is normally based on the rental income. Although structurally vacant buildings generate no income and have no perspective of future tenancy, appraisal of structurally vacant buildings is often based on potential tenancy of the property using either the cap rate or discounted cash flow methods (Hendershott, 1996, Hordijk and van de Ridder, 2005, Ten Have, 1992, 2002). The accounted value is usually too high for re-developers, who calculate land and existing building value residually. As long as these two ways of calculating the value of structurally vacant office buildings are not compatible, the price will be experienced as too high by re-developers and too low by owners. A too high purchasing price has a negative impact on the conversion potential.

8.2.2. Influence of stakeholders: opportunities and risks

The most important stakeholders regarding adaptive reuse potential are owners, developers, investors and local and national government. If the owner is not willing to adapt or sell the building to a developer, adaptive reuse will not be realised. Investors and developers will only be willing to buy and transform a building when this fits with their real estate strategy and provides sufficient return on investment. The government plays an important role by initiating stimulating planning regulations and allowing new functions by changing the zoning plan in case the current plan does not incorporate the new function(s). An important factor is the city council's policy. If municipalities want to strengthen the living function in the inner city or in other areas, conversion of office buildings into housing may be a successful option. However, when an area is designated as an office area or so-called Office Axe (a linear zone allocated to offices), continuation as an office building may be more appropriate. So, a check on the current zoning plan and willingness to adapt is important. In some cases there are grant subsidies available for conversion projects.

Other actors such as inhabitants of surrounding dwellings may have an impact as well. Because buildings-in-use contribute to the local economy and/or contribute to a safe and vivid environment, usually neighbours will accept adaptive reuse. However, if the current building is highly appreciated due to its architectural appearance, cultural-historical value or its identity, much resistance may be experienced if plans are made to change the building's appearance.

8.2.3 Location potential: opportunities and risks

Adaptive reuse requires that the location fits with the requirements of the new target group i.e. prospective new users and owners. Worldwide, properties in city centres, housing areas or edges of such areas are converted into housing, while conversion of buildings in business parks and peripheral areas rarely happen. Building conversions in city centres can offer valuable additions to the existing housing stock. Considering the functionally realisable apartment types as well as the location of office buildings, interesting target groups (buyers or renters) can be found. Office buildings in mono-functional business parks however, are not regarded fit for conversion into housing. When structurally vacant office buildings are situated in such locations, transformation of the area is necessary (Avidar et al., 2007, Smit, 2007b, Koppels et al., 2011).

8.2.4 Building characteristics: opportunities and risks

The *functional* adaptability of vacant buildings is of critical importance to conversion feasibility. This depends inter alia on the measurements of the buildings' structural grid (Douglas, 2006, Geraedts and Van der Voordt, 2007). For instance, post-war office buildings were designed as "cockpits" to fit closely around the function they were meant to accommodate (Brand, 1994). This tight fit threatens the functional feasibility of conversion into housing.

A high *architectural or cultural-historical value* and being marked as a monument will hinder demolition and stimulate adaptive reuse (Benraad and 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.

A poor *technical* condition forces intervention to improve the building to the required quality level, which is a hindering factor for conversion due to the high costs.

Legal aspects can also reduce the financial feasibility of conversions, for instance due to strict Building Code regulations, planning rules or zoning plans that allow particular functions and limit or forbid other functions, or regulations limiting the maximum building height. As the requirements for residential buildings and other buildings that accommodate overnight-stays are stricter than for day-use functions such as offices, adaptations of building structure, stairways and facades are often needed.

Usually, building characteristics do not make conversion impossible, but they can influence *financial feasibility* substantially (Mackay et al., 2009). When conversion costs become too high compared to the expected benefits, conversion may be financially unfeasible. Mackay *et.al.* (2009) studied several Dutch conversion projects and found an evident relationship between building costs and the alterations of specific building elements. The major cost generator for most office-to-housing conversions is facade-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 converted building. The necessity for facade alterations should therefore be thoroughly assessed when studying office-to-housing conversion potential.

8.3. Conversion Meter

To assess the opportunities and risks of conversion of vacant office buildings to dwellings and to define its conversion potential in a systematic, efficient way, the factors and aspects mentioned above have been integrated in a Conversion Potential Assessment Tool, in short: Conversion Meter, formerly known as the Transformation Meter (Geraedts, 2002, Geraedts, 2007, Geraedts, 2004b). Methods to develop this tool included a literature review, interviews with experts such as developers and housing associations with practical experience in converting office buildings to housing, and case studies to test preliminary versions of the tool. The first version, Transformation Meter 1.0, was developed during the late 1990s, when the Netherlands suffered from high levels of office vacancy. Since then, many graduation students from the Faculty of Architecture at the Delft University of Technology and students from other universities as well have conducted case studies to test and evaluate the tool. Most theses have been written in Dutch, with a few exceptions in English; see (Blanksma, 2013, Van den Berg Jeths, 2013, Mensing, 2014, Damwijk, 2015). These practical applications allowed us to further improve and refine the transformation potential meter (Geraedts, 2014). Two new steps - the financial feasibility scan and the risk assessment checklist – have been added to permit further investigation of the feasibility of a conversion project. In this section, we describe the principle of the new transformation meter and its position in the Go/No Go decision-making process in the initial phase of a conversion project: the Conversion Meter.

8.3.1 The Conversion Meter at a glance

In essence, this instrument consists of several checklists be used to appraise the potential of vacant buildings for conversion to residential use. This appraisal takes place in a number of steps, from more superficial to more detailed and specific, see Table 8.2: Overview of steps to be taken).

Table 8.2: Conversion Meter Process

Step	Action	Level	Outcome
Step 0	Inventory market supply 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

Step 0 is the inventory of the market supply of unoccupied office space. This step is relevant when a municipality wants to explore which buildings are vacant in a particular area, or if a property owner wants to identify vacant buildings in a real estate portfolio. In case of a scan of a particular vacant building step 0 is skipped.

Step 1 is a Quick Scan or initial appraisal of the conversion potential of vacant buildings, by using a limited number of veto criteria regarding the Market, Stakeholders, Location and Building characteristics. Failure of a building to meet these criteria means that it does not have sufficient conversion potential and thus leads to a NO GO decision.

Step 2 is a more detailed feasibility scan, a further appraisal using gradual criteria, which shows which features of the location and the building positively contribute to its conversion potential and which do not.

Step 3 calculates an overall conversion potential score and the conversion class) expressing the conversion potential of the building(s) on a scale ranging from not suitable for conversion to excellent suitability. Depending on the results, this may lead to a NO GO decision or to further refinement of the feasibility study in two subsequent phases.

Step 4 is a financial feasibility scan of the conversion project, based on key figures regarding the costs of conversion and revenues from rental income.

Step 5 is a checklist for the assessment of possible risks and ways to mitigate the risks. Depending on the nature of the project involved, step 5 may come before step 4. The conversion potential assessment tool is particularly intended for use in the initial phase of the plan development process, from the first quick scan to a well-considered decision whether or not to proceed with the project.

8.3.2 A closer look at the five steps

Step 0: Inventory of supply at city, district or portfolio level

As a pre-step before actually starting to use the Conversion Potential Assessment Tool, an inventory may be needed of the market supply of office buildings in a particular municipality, area or portfolio that have been unoccupied for a long time or may be expected to become vacant in the near future. Information may be obtained from a literature survey, data from real estate agents or the investigator’s own observations.

Step 1: Quick Scan; first impression, evaluation based on veto criteria

The instrument offers the user the possibility to perform a quick initial appraisal of the conversion potential, which is not very labour-intensive and does not require much data. This quick scan makes use of six veto criteria under the headings Market, Stakeholders, Location and Building, see Table 8.3.

Table 8.3: Step 1 Quick scan with veto criteria

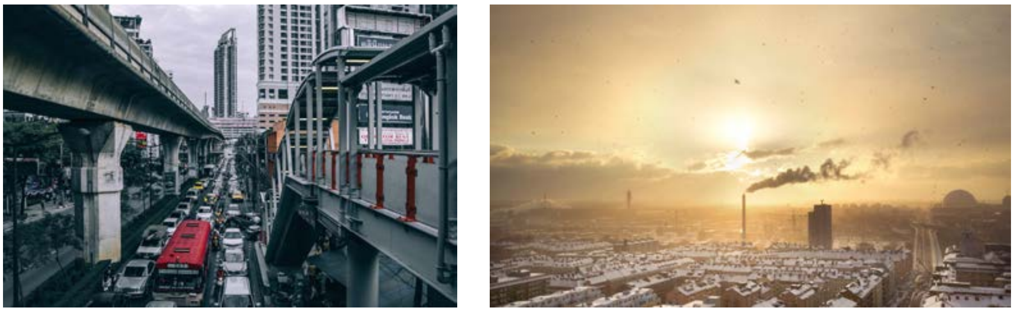
STEP 1 QUICK SCAN: initial appraisal of unoccupied offices using veto criteria

Common target group independent criteria.
*Answer '**Yes**' (score = 1) is positive for conversion into homes. Answer '**No**' (score = 0) is negative for conversion into homes*
The user of this checklist could reconsider if these criteria actually lead to a veto decision.
If one of the veto criteria concerned lead to the assessment 'No', the conversion into housing is cancelled.
In that case the next step 2 (Feasibility scan: further appraisal using gradual criteria) is no longer applicable.

ASPECT	VETO CRITERION	DATA SOURCE	Assessment	
VETO CRITERIA MARKET			Yes	No
1 Demand for housing	1 There is a demand for housing of local target groups	Estate agent or municipality		
VETO CRITERIA STAKEHOLDERS				
2 Initiator (advisor)	2 Presence of enthusiastic influential instigator	Local investigation		
3 Developer	3 Does meet criteria for region, location, accessibility	Property developer		
	4 Does meet criteria on size and character of building	Property developer		
4 Owner	5 Willingness to sell the building	Owner		
5 Investor	6 Willingness to buy and transform the building	Investor		
6 Municipality	7 Positive attitude of the municipality	Municipality		
VETO CRITERIA LOCATION				
7 Urban location	8 Zoning plan permits modification	Zoning plan, policy of municipality		
	9 No serious public health risk (pollution, noise, odour)	Estate agent or on site inspection		
VETO CRITERIA BUILDING				
8 Dimensions of skeleton	10 Free ceiling height > 2.60	Estate agent or on site inspection		
		RESULT QUICK SCAN:	**0**	**0**

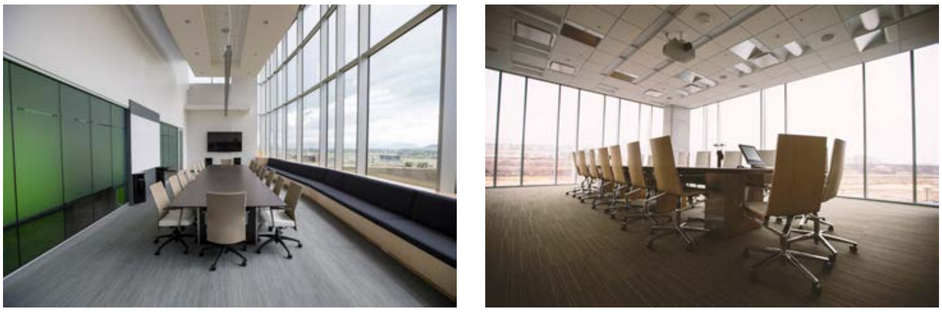
A veto criterion is a criterion that if not satisfied (if the answer to the relevant question is 'No') leads to rejection of the option to convert the building into residential accommodation. Further detailed study is then no longer necessary. This is thus an effective means of selecting promising candidates for conversion quickly from the real estate market.

Figure 8.3: Illustrations of Veto Criterion Location 7.9:
No serious public health risk (pollution, noise, odour) (source: unsplash.com)



The veto criteria apply to all target groups. Veto criterion 5 at location level concerns the situation of the building within the urban fabric. If the building is located at an industrial site where serious public-health hazards have been discovered, or if the authorities do not allow any modification of the zoning plan at this location, there is little point in taking the investigation of the conversion potential any further.

Figure 8.4: Illustrations of Veto Criterion Building 8.10:
Free ceiling height > 2.60 (source: unsplash.com)



Step 2: Feasibility scan based on gradual criteria

If the results of the Quick Scan indicate that there is no immediate objection to conversion (no single question is answered 'No'), the feasibility of conversion can be studied in greater detail by assessing a number of 'gradual' criteria, i.e. criteria that do not lead to a GO/NO GO decision but express the conversion potential of the building and its location in a numerical score. Taken together, these criteria provide an overall picture of the conversion potential of the project.

The feasibility scan at location level (Table 8.4) includes 7 main criteria, subdivided into functional, cultural and legal aspects, and 23 sub-criteria. The feasibility scan at building level (Table 8.5) comprises 14 main criteria, subdivided into functional, cultural, technical, and legal aspects, and 29 sub-criteria. An answer 'Yes' to any question indicates somewhat higher suitability for conversion. At the end of the scan, the number of 'Yes's' is added up to obtain the overall conversion potential score – the higher the better. This is described under Step 3 below. It may be noted that the criteria vary somewhat, depending on the target group considered. For example, students will prefer to live in the city centre where there is more nightlife, while young families with children will tend to opt for a peaceful suburban environment.

Table 8.4: Step 2 Feasibility scan using gradual criteria at location level; answer 'Yes' (score = 1) is positive and answer 'No' (score = 0) is negative for conversion into homes

STEP 2 FEASIBILITY SCAN: further appraisal using gradual criteria

*Answer '**Yes**' (score = 1) is positive for conversion to homes. Answer '**No**' (score = 0) is negative for conversion into homes*
The user of this checklist could reconsider if on of these these criteria actually has to be a veto criterion.
If so, then this criterion switches to Step 1 and the other way around.

LOCATION

ASPECT	GRADUAL CRITERION	DATA SOURCE	Assessment	
FUNCTIONAL			Yes	No
1 Urban location	1 Building in suitable area (not remote industrial or offices area)	Town map / Google Maps		
	2 Good daylight/sunlight possibilities	On-site inspection		
	3 Good view from building, > 75% floor space	On-site inspection		
2 Distance and quality of facilities	4 Shop for daily necessities < 500 m.	Local investigation / Google Maps		
Remark:	5 Neighbourhood meeting-places (square, park) < 500 m.	Local investigation / Google Maps		
The quality of facilities can be described in terms	6 Food service industry (bar, café, restaurant) < 500 m.	Local investigation / Google Maps		
of quality, a wide variety and the number of	7 Bank / post office < 5 km.	Local investigation / Google Maps		
different facilities	8 Basic medical facilities (practice, health centre) < 2 km.	Local investigation / Google Maps		
	9 Sports facilities (fitness, swimming pool, sports park) < 2 km.	Local investigation / Google Maps		
	10 Educational facilities (from kindergarten to university) < 2 km.	Local investigation / Google Maps		
3 Accessibility by public transport	11 Distance to railway station < 2 km.	Town map / Google Maps		
	12 Distance to bus, tram, underground < 1 km.	Town map / Transport services		
4 Accessibility by car and parking facilities	13 Good flow, normal street quality	Local investigation / Google Maps		
Obstacles: bottlenecks or thresholds in roads, bridges	14 Distance to parking sites < 250 m.	Local investigation / Re-design		
Flow: 1-way traffic, no parking, traffic jam	15 > 1 parking lot/100 m2 office space	Local investigation / Re-design		
CULTURAL				
5 Representative impression	16 Situated centrally (not near highway locations)	Town map / Google Maps		
Remark:	17 Other buildings present in direct neighbourhood	Town map / Google Maps		
Assessment of location dependent of target group	18 Lively neighbourhood	On-site inspection / local press		
E.g. Youngsters not in mono-functional area	19 Direct availability of green environment	Local investigation / Google Maps		
E.g. 55+ not outside city centre	20 Area has a good reputation/image; no vandalism	On-site inspection / local press		
Related to impression of building	21 Area has good air quality and low pollution and noise hindrance	On-site inspection / local press		
LEGAL				
6 Urban location	22 Noise load on façade < 50 dB (e.g. max. for office building is 60 dB)	Municipal authorities		
7 Ownership of location	23 Land in property or with short lease	Estate agent / municipality		
		Total Location (=number Yes):	0	x
		Default weighting:	5	=
Maximum score for Location (with default weighting 5) = 23 x 5 = 115		Maximum Score Location:	115	
		FEASIBILITY SCAN LOCATION:	**0**	**A**

Figure 8.5: Illustrations of Gradual Criterion Location 3.11/12: Distance to railway station < 2 km.; distance to bus, tram, underground < 1 km. (source: unsplash.com)

Figure 8.6: Illustrations of Gradual Criterion Location 5.16: Situated centrally (not near highway locations); (source: unsplash.com)

Figure 8.7 Illustrations of Gradual Criterion Location 5.20: Area has a good reputation/image; no vandalism (source: unsplash.com)

Table 8.5: Step 2 Feasibility scan using gradual criteria at building level
Answer 'Yes' (score = 1) is positive and answer 'No' (score = 0) is negative for conversion into homes

STEP 2 FEASIBILITY SCAN: further appraisal using gradual criteria

*Answer '**Yes**' (score = 1) is positive for conversion to homes. Answer '**No**' (score = 0) is negative for conversion into homes*
The user of this checklist could reconsider if on of these these criteria actually has to be a veto criterion.
If so, then this criterion switches to Step 1 and the other way around.

BUILDING

ASPECT	GRADUAL CRITERION	DATA SOURCE	Assessment Yes	Assessment No
FUNCTIONAL				
1 Year of construction or renovation	1 Building > 3 years	Year of construction		
	2 Building renovated > 3 years	Year of last renovation		
2 Vacancy	3 Complete building is vacant	Estate agent		
	4 Building vacant > 3 years	Estate agent		
3 New housing	5 Capacity building > 20 1p-units / 50 m2	≥ 1000 m2 floor space		
	6 Lay-outs adaptable for local target groups	Sketch design		
4 Extendibility	7 Horizontal extension building possible (neighbouring buildings)	On-site inspection / Google Maps		
	8 Vertical extension building possible (no inclined roof/light construction)	On-site inspection / estate agent		
	9 Possibilities for constructing basement	On-site inspection / estate agent		
CULTURAL				
5 Representative impression	10 Identifiable compared to surrounding buildings	On-site inspection		
Related to impression of location	11 Own identity realisable	On-site inspection / re-design		
6 Cultural heritage	12 Being not a cultural heritage: simplifies transformation	Municipality / Authorities		
7 Access (entrance, elevators, stairs)	13 Clear, safe and clarifying building entrance	On-site inspection / re-design		
TECHNICAL				
8 Condition of maintenance	14 Well maintained; maintenace up-to-date	On-site inspection / facades		
9 Dimensions of support structure	15 Depth of building < 10 m.	On-site inspection / estate agent		
E.g. Facade grid size determines location inner walls	16 Grid support structure > 3.60 m	On-site inspection / estate agent		
	17 Height dimension between floors < 6.00 m	On-site inspection / estate agent		
10 Support structure (walls, columns, floors)	18 Condition support structure is good / not hazardous	On-site inspection / estate agent		
11 Facade	19 Possible connection inner walls on grid < 5.40 m.	On-site inspection / estate agent		
External living space dependant of target group	20 Facade/openings well adaptable	On-site inspection		
Cultural heritage: limited / no adaptability	21 Facade windows can be reused / opened	On-site inspection / re-design		
12 Installations	22 Sufficient service ducts can be constructed	On-site inspection / re-design		
LEGAL				
13 Environment	23 Absence of large amount of hazardous materials in building	On-site inspection / municipality		
Exposure to sunlight, air, noise pollution,	24 Acoustic insulation of floors > 5 dB	On-site inspection / re-design		
hazardous materials	25 Good thermal insulation of facades and roof	On-site inspection / municipality		
	26 Sufficient daylight factor > 90% floor surface new units	On-site inspection		
14 National Building Decree, escape and access routes	27 Elevators available / easy realisable in building (> 4 stories)	On-site inspection / estate agent		
	28 (Emergency) stairways available / realisable	On-site inspection / re-design		
	29 Distance of new units to stairs/elevators < 50 m.	On-site inspection / re-design		

	Total Building (=number Yes):	0	x
	Default weighting:	3	=
Maximum score for Building (with default weighting 3) = 29 x 3 = 87	Maximum Score Building:	87	
	FEASIBILITY SCAN BUILDING	**0**	**B**

Figure 8.8: Illustrations of Gradual Criterion Building 11.19/20:
Possible connection inner walls on grid < 5.40 m.; facade/openings well adaptable (source: unsplash.com)

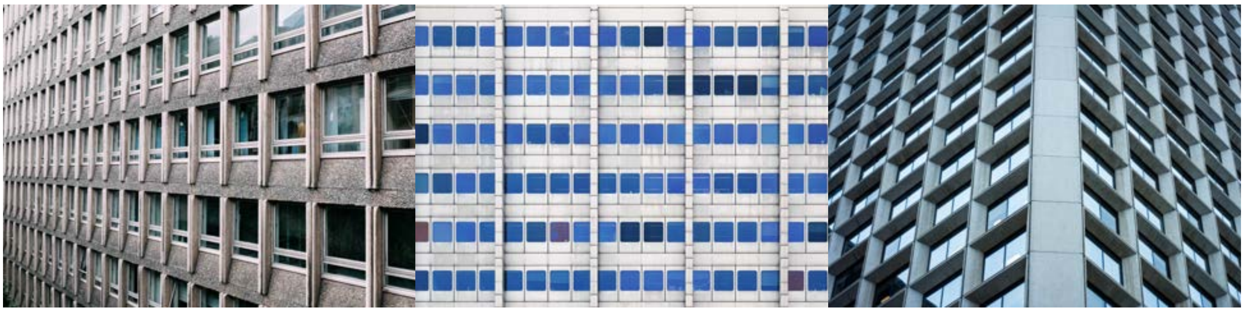


Figure 8.9: Illustrations of Gradual Criterion Building 13.26:
Sufficient daylight factor > 90% floor surface new units (source: unsplash.com)

Step 3: Determination of the conversion potential class

The results of the feasibility scan can be used to calculate a conversion potential score, based on which the building can be assigned to one out of five conversion classes ranging from 'No Transformation potential' till 'Excellent Transformation Potential', see Table 8.6.

Table 8.6: Step 3 Determination of conversion potential class of office building

STEP 3: DETERMINATION CONVERSION POTENTIAL CLASS OF OFFICE BUILDING			
CONVERSION SCORE	**CONVERSION CLASS**		
Conversion Score Location + Building = 0 - 40	Class 1: No transformation potential	**Total Score Feasibility Scan A + B:**	0
Conversion Score Location + Building = 41 - 80	Class 2: Hardly any transformation potential	Maximum Score Location + Building	
Conversion Score Location + Building = 81 - 120	Class 3: Limited transformation potential	= 115 + 87 =	202
Conversion Score Location + Building = 121 - 160	Class 4: High transformation potential		
Conversion Score Location + Building = 161 - 202	Class 5: Excellent transformation potential	**CONVERSION CLASS**	1

The total scores for the location (result 'A' in Table 4) and the building (result 'B' in Table 5) are determined by multiplying the number of Yes's in the respective tables by a weighting factor, which has provisionally been chosen as 5 for the location and 3 for the building to reflect the greater relative importance of the location in these considerations. The maximum possible score for the location is thus 23 x 5 = 115, and for the building 298 x 3 = 87, summing up to a grand total of 115 + 87 = 202 (see Table 8.6). The minimum score is zero, which would indicate that no single feature of the location or the building is considered suitable for conversion.

Buildings in Conversion Class 1 (scoring lower than 40) are assessed as not suitable for conversion to residential accommodation, while those in Class 5 (scoring higher than 161) are perceived as excellently suitable for conversion. In the examples of Table 3 and Table 4 no assessment scores for Location and Building have been filled out yet, and as such the total scores in Table 6 is '0', corresponding with Conversion class 1: Not Transformable.

The total score is an indication of the conversion potential but does not define the final decision. In practice, some criteria can be more dominant than others. Decision-makers are free to adapt the default weight values of 3 (building) and 5 (location) if that fits better with the particular context.

Determination of the conversion class of an office building completes the first three steps of the Conversion Potential Assessment Tool. If the results indicate that the building has sufficient potential for conversion (i.e. that it falls into Conversion Class 4 or 5), the analysis can be continued by two additional steps, aimed at studying the financial feasibility of the conversion project (Step 4) and conducting a risk assessment for further planning (Step 5). Depending on the nature of the project involved, step 5 may come before step 4. The Conversion Potential Assessment Tool is particularly intended for use in the initial phase of the plan development process, from a first quick scan to a well-based decision about whether or not to proceed with the project.

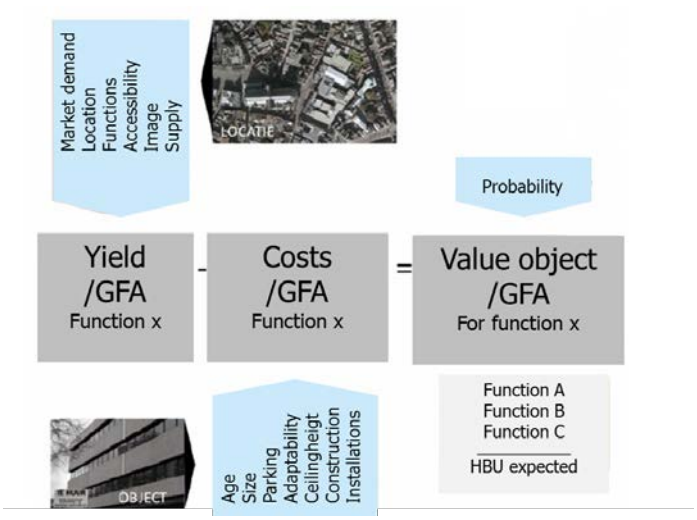
Step 4: Financial feasibility scan

The financial feasibility scan aims to obtain an indication of the viability of a conversion project. It is not meant yet as a detailed calculation based on the costs of all construction elements, materials, labour costs etc. The financial feasibility depends among other things on the acquisition costs, the current condition of the building, the level of renovation or modification work required, the finishing and comfort level of the housing, the number of (extra) dwelling units that can be created in the building and the project yield by rental income and/or sales prices (Gelinck, 2013). On the revenue side, key-figures are the number of dwellings that can be created for the intended target groups, and the rent level or purchase price these target groups might be willing to pay. A sketch plan of a possible layout of the building after conversion is useful to get an indication of the number and types of dwellings that can be incorporated in the current building. The financial feasibility can be improved by increasing the size of the building, e.g. by adding extra floors on top, by a horizontal extension, or by the inclusion of commercial functions (usually at ground level). On the expenses side, it is necessary to know the acquisition costs for the premises, including the land price, and the conversion costs i.e. the building and installation costs. Relevant questions to be asked are for instance: what is the current condition of the building? Which parts can be reused, and which will have to be demolished? What is the ratio of façade surface area to gross floor area (GFA)? To what level should the building be finished? To what extent can the existing stairways, lifts and other means of access and façade proportions be maintained?

These issues are all included in a residual value approach to adaptive reuse. In this approach, stepwise first the potential yield of the new use is calculated, second, the costs for the building adaptation, and third, the residual value results from the yield minus the costs calculation. The calculation can be done on different potential new uses. As a final step in the residual value approach, the residual value of the different options can be compared, to decide on the Highest and best use (HBU) of the adaptive reuse. Step 1 is calculated based on yield-generating characteristics: market demand, Location functions mix, accessibility, image and available supply. Step 2 is based on cost generating characteristics like already described in the feasibility criteria: Building age, size, parking, adaptability, ceiling height, construction, installations.

Figure 8.10 visualises the residual approach: if one knows the purchase price and conversion costs, and defines the required return on investment, one also knows the investment budget that is available for conversion of the building.

Figure 8.10: Approach to defining the residual value of an office to residential conversion



After an approximate cost-benefit analysis has been made on the basis of a sketch of the way in which various dwelling types and layouts can be fitted into the existing office building, the data can be used as input for the development plans of the property developer.

Many reference documents are available with key cost figures or rental prices and project costs for various building types. Unfortunately most cost data refer to new built projects. Less costs and benefit information is available about conversion projects. The reason is probably that both conversion costs and purchase prices and benefits from rental income or selling price are affected by many factors including the national and local current real estate market of demand and supply and the level of interventions that are needed to convert the current office building into housing of sufficient quality. For instance, the construction costs for transforming the façade are very dependant of the condition of the current façade and the possibility to reuse (parts of) the facade. The state of the support structure and foundation are other examples that can have a high impact on the conversion costs differences between projects. After all, each conversion project is unique (Mulder, 2015). As a consequence, the key cost figures of conversion projects show a huge range.

Table 8.7 shows some key conversion and purchase cost figures that determine the total investments costs, based on 12 cases of the Stadswonen Housing Association in Rotterdam, the Netherlands. The data originate from 2002 and have been updated till 2016 by P. de Jong, Delft University of technology (February 2017). A distinction has been made between conversion projects with a low or a high level of interventions. All figures are in Euro's/m2 gross floor area (GFA), including VAT. The cost differences between the most expensive and least expensive projects showed to be determined to a large degree by the costs of (conversion of) the façade. The inner walls are on average more expensive, but these costs are less variable and thus have less influence on the overall level of the structural costs. The current supporting structure also has a significant influence on the total costs.

Table 8.7: Indication of conversion and purchase costs based on 12 cases from the Netherlands

Dwelling types and Residents	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 8.8 shows an overview of monthly rental income and residual investment budgets per unit and per m2 rental floor area (RFA) or m2 gross floor area (GFA), in connection to different dwelling types and target groups (Geraedts, 2004a, Vrij de, 2002). The data are based on the same 12 cases as in Table 8.7 and also have been updated by P. de Jong, TUD, February 2017. The ratio between GFA/RFA varied the case studies from 1.3 - 1.55. The target groups define the required type of home, the number and layout of the rooms, access, appeal and the size of the outdoor area. Using this data, floor plans can be drawn and fitted in the existing building. When drawing floor plans, existing stairs, lifts, access paths, design lines and façade boundaries must be respected. Based on the layout of the homes, the number of homes can be estimated and an indication of the rental price or selling price can be established.

Table 8.8: Feasible rental income and investments per unit
Per m2 rental floor area (RFA) and per m2 gross floor area (GFA);
the assumed ratio between both floor areas: GFA/RFA = 1.3 - 1.55

Dwelling types and Residents	Rent/month of dwellings	Feasible investment per unit	Feasible investment per m2/RFA	Feasible investment per m2/GFA
Student room	176 - 242	35.580 - 53.370	1.100 - 1.460	770 - 1.010
Studio	242 - 352	53.370 - 77.090	1.460 - 2.170	1.010 - 1.540
2/3-room apartment, young couples	605 - 825	130.460 - 177.900	1.920 - 2.300	1.300 - 1.720
4-room apartment, young couples	825 - 1100	177.900 - 237.200	1.920 - 2.5.50	1.300 - 1.900
3-room apartment, senior citizens	440	88.950	940 - 1.200	590 - 950
4/5-room apartment, senior citizens	605 - 1210	130.460 - 260.920	1.300 - 2.550	830 - 1.900

To get a better understanding of the large range of key cost figures of conversion projects use can be made of form figures (Schmidt, 2013). An example is the ratio between rental floor area (RFA) and gross floor area (GFA). This ratio explains how much floor area is used for construction, facilities and circulation areas. The higher this ratio is, the better the space utilisation of the building. A project with less efficient floor plans is usually less financially feasible. Small homes are often easier to fit in existing buildings, which increases the efficiency. For tower blocks, the division into dwellings is less efficient than for elongated buildings. In the tables above an efficiency ratio of gross floor area (GFA)/rental floor area (RFA) between 1.3 and 1.55 is assumed. Other key data are the shape of the layout and the relationship between open and closed parts of the façade. The floor layout could influence the façade surface. Square layouts have less façade surface than elongated floor plans. The amount of open and closed parts of the facades influences the financial feasibility because closed parts usually are cheaper.

Future value
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 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 taking into account the initial construction costs, an adaptable building is less attractive than a 'non-adaptable' building (Hermans, 2014). Therefore, not only investment costs should be taken into account but also the total lifecycle costs.

Total lifecycle costs
A lifecycle cost approach focuses is on integral housing costs and benefits during the whole lifecycle. The following elements are taken into account (Hermans, 2014):

- The added value of adaptability to lower operating costs;
- The added value of adaptive capacity to lower adaptation costs in the future;
- The contribution of adaptive capacity to better lettability and/or market selling value;
- Reduction of total costs of ownerships (TCO) and asset management;
- Incorporation of the principle of the circular economy.

Circular economy concerns the legacy to aim for a maximum reuse of construction components and natural resources to prevent elimination of value. Each construction component has a residual value that can be reused, and this value needs to be considered in the financial feasibility.

Step 5: Risk assessment checklist with possible solutions

When the Quick Scan indicates that an office building has sufficient conversion potential at both the location and the building level and the results of the initial financial feasibility analysis are also encouraging, the involved actors may proceed to the subsequent development phases. It is of great importance to be aware of the possible bottlenecks and risks that may come to the fore. Table 8.9 and 8.10 also present risk inventories. Both are based on experience gained in a large number of projects. Neither of these lists is exhaustive. Both checklists list the possible risks under the same headings as those used in the quick scan and feasibility scan i.e. from a functional, cultural, technical, legal and financial point of view. Table 8.9 presents a risk assessment list with possible solutions at Market and Location level, including the point of view from some important stakeholders. Table 8.10 presents a risk assessment list with possible solutions at building level.

Example of risk at stakeholders' level: zoning plan
Risk: The local authorities are not ready or willing to approve any changes in the zoning plan required for success of the project. This is one of the points that need to be thoroughly explored in advance by consulting and convincing the authorities concerned.
Solution: try to convince the municipality of the benefits of conversion to the new functions and use the power and interests of involved stakeholders and prospective tenants.

Example of risk at location level: noise pollution
Risk: Excessive noise level at façade. According to the Dutch Noise Pollution Act, this value should not exceed 60 dB for offices and 50 dB for dwellings. Similar levels are used internationally.
Solution: Many inner-city locations are situated near major roads, railways or industrial premises. If the properties are rezoned for residential use, they will have to meet much more stringent requirements and quite extensive measures may be needed to ensure compliance. Exemption may sometimes be granted for residential property situated near major roads or railways, i.e. the maximum permitted noise level at the façade may be raised in such cases, but extra measures will still have to be taken to keep the sound level within the building at acceptable levels. Some of these measures will involve modification of the building, but noise screens placed round the source of the noise may also be effective. Another option is to locate rooms where less stringent noise standards apply, such as workshops or bathrooms, where the noise load is highest.

Table 8.9: Risk assessment checklist, possible solutions and important stakeholders

MARKET & LOCATION	RISC		POSSIBLE SOLUTION
1. Functional	1	Insufficient parking places	Dependant of target group; consultation about parking rules; consider parking basement
	2	Lack of facilities	Low scale facilities in building; collaboration with other stakeholders
	3	Absence public transport	Consulting public transport companies; collaboration with other stakeholders
	4	Unclear routing to building	Analysis neighbourhood; replacement main entrance or adding extra entrance
2. Cultural	5	Bad reputation or unsafe neighbourhood	Improvement neighbourhood in collaboration with other stakeholders; choice for specific target group
3. Technical	6	Annoyance of odour	Specific insulation of facades concerning
	7	Annoyance of noice	Possibilities for dispensation; extra noise insulation facades; extra membrane façade
4. Legal	8	Zoning plan change/procedure	Consulting local authorities; assessment of local policy and regulations
	9	Ground posession/lease	Unfavourable for development ground value; trying to reimburse ground lease
	10	Ground pollution	Clear ground declaration by owner; negotiating lower ground selling price due to cleaning ground costs
	11	Restriction maximum building height	Research for possibilities horizontal extension possibilities
5. Financial	12	Purchasing price dwellings to high	Extra benefits trough combination with commercial functions; redesign plot; other target group
	13	Bad lettability of dwellings	Improvement price/quality ratio; choice for other target groups
	14	Necessity of other, new facilities	Enhance financial feasibility by adding commercial functions
STAKEHOLDERS			
1. Initiator	15	Absence of enthusiastic influential initiator	Search for experienced instigator at other successfull locations, realised projects
2. Developer	16	Does not meet criteria for region, location, accessibility	Consulting and convincing property developer; search for other property developer
	17	Does not meet criteria on size and character of building	Consulting and convincing property developer; search for other property developer
3. Owner/investor	18	Not willing to sell the building	Consulting and convincing owner on realistic costs and benefits of building staying vacant

Example of risk at building level: poor financial feasibility
Risk: a (too) high acquisition price of the office building, renovation costs that are higher than expected, or a small size of the building so that all costs have to be paid back by a limited number of tenants.
Solution: In case of conversion of office buildings to residential accommodation, in general the larger the complex to be converted, the easier it is to make the project financially feasible. The investments needed to make the existing building suitable for residential purposes can be partially financed by extending the size of the building, horizontally and/or vertically (by adding new storeys on top of the building). One advantage of adding new built premises is that the extra land costs are basically zero. If new floors are added, the building's supporting structure must be strong enough to bear the extra load, or must be reinforced to this end. Horizontal extensions must fit in with the location and usually permits must be obtained from the municipal authorities (town planning, building control, fire safety). Another possible way of improving the financial feasibility is to rent out retail, business or office space on the ground floor or to rent out parking space. Currently exemptions from particular building regulations can be received, provided that that converted buildings should comply at least with the building regulations of the year when the original building was constructed.

Figure 8.11: Puntegale, Rotterdam

(source: Stadswonen, Rotterdam).

One of the early icons of conversion by Stadswonen Rotterdam, the Netherlands. This former tax office (built in 1940-1946) has been converted into dwellings for students and starters i.e. young people entering the housing market (1999). Opportunities for conversion were the high need for housing, a housing association in search for inner city building locations, the attractive appearance of the building, the beautiful entrance hall, and the expected increase of the value of assets due to a revitalisation and upgrading of the whole area. Hindering factors were the low return on investment, noise annoyance, and no permission to add balconies to the façade due to its status as a municipal monument. Thanks to a clever re-design the final result is a successful conversion that fits with current user requirements, regulations for new building in the Building Code, and sustainability principles

Figure 8.12 Atlantic House (based on Remøy et al, 2015)

The redevelopment of the national listed monument Atlantic House at the Westplein in Rotterdam was initiated by the property developers Van Herk and HD, and completed in 2009. The vision behind the development was simply to give this monumental building, completed in 1928, a second life and to bring back its grandeur. The original building was developed with an architectural idea of spatial flexibility behind a uniform façade – a very avant-garde idea for its time. During the last years, several plans were made for the conversion of this former office building into apartments. These plans were not feasible because some floors seemed unsuited for apartments. When the building was converted by Van Herk and HD in 2009, it was feasible due to several smart design solutions, and good cooperation with the municipality of Rotterdam. After conversion this building includes 50 apartments, different types, 4 offices (1st floor), a restaurant and shops (at the ground floor). The apartments are privately owned.

The street facade, the roof and the public indoor spaces, including the restaurant, had to be conserved as part of the monument listing. The developer had experience with this type of conversions and with the Rotterdam market. The original flexibility concept was brought back in the project, and meant that apartments were developed as lofts, but also that adaptations were reversible. The building was sustainably converted; several original building parts were reused, like the original parking basement and the entrance hall. On the attic floor, new maisonettes and large roof terraces were introduced. The conversion gave the possibility to apply modern and energy saving measures. For example, thermal energy storage was developed specially for this project. Heat leaks were removed.

The success factors of the project were the location near Rotterdam city centre, the characteristic external appearance, the flexibility of the layout, and the cooperation with the municipality and their willingness to co-create new solutions for this project.

Table 8.10: Risk assessment checklist with possible solutions at Building level

BUILDING		RISC	POSSIBLE SOLUTION
1. Functional	1	False presuppostion with possibilities building	Analysis form factors, key rations, data; gross/nett floor area; extension possibilities (horizontal/vertical)
	2	Building depth to small	Adaptation layouts; enlanrgement depth by new foundation/facades; adding external gallery
	3	Building depth to large	Adaptation layouts; adding new open inner space (daylight) centralise entrances
	4	No basement available (f.i. for parking places, storage space)	Adding basement (dependant of foundation and access possibilities)
	5	Floor height to large	Use of lightweight mezzanines, combined with lightweight interior walls
	6	Windows can not be opened	Replacement windows; façade renovation
	7	Less connection possibilities for inner walls at facades	Connectable inner walls till complete façade renovation
	8	Lack of outdoor space	Target group dependant; French balconies; recessed parts façade; inner garden
	9	Insufficient elevators/stair cases (access and escape routes)	New elevators/stair cases within or extern building
	10	Insufficient access possibilities	Analysis different access possibilities (portico, gallery, inner corridor, central)
	11	Qualititive/quantitative insufficient existing inner walls	Adapt existing walls; adding new walls (future adaptability)
	12	Insufficient waterproofness for bathrooms	Waterproof finishing floors; use of prefab (plastic) bathrooms
2. Cultural	13	Limitations by monumental status	Early consulting with monumental agency and local government
	14	Insufficient distinguishability of building	Adding new façade (parts), balconies, dwelling entrances
	15	Insufficient distinguishability of building entrance	Emphasise by louver or something likewise; replacement to other location
3. Technical	16	False presuppostion with (quality of) construction status	Analysis construction status on site (design, condition, finishing, maintenance)
	17	Insufficient air climat facilities	Replacement/renewal adjusted to dwellings; individual md op woningen; individueel operated
	18	Insufficient piping, tubes and shafts	Extension (fire resistant walls between dwellings; holes in existing floors)
	19	Insufficient water supply facilities (f.i. need dwellings > offices)	Extension facilities (individual controlable and measurable)
	20	Insufficient electricity facilities	Extension facilities (individual controlable, measurable)
	21	Insufficient noise insulation of floors	Enhance floor insulation by double floors and/or double ceilings
	22	Insufficient thermal insulation of facades	Extra insulation outside or inside façade (monumental status); mind adapting windows
	23	Insufficient thermal insulation of windows	Replacement by double glazing; extra secundairy frame; extra membrane façade Inside or outside)
	24	Insufficient thermal insulation of facades of roof	Insulation existing roof (inside/outside); replacement by new roof; combine with vertical extension
	25	Presence of moisure, humidity	Analysis causes; humidity, leakage, condensation
	26	Bad flushing in facades	Cleaning façade; new flushing (partly of total)
	27	Insufficient daylight and sunlight (< 10% floor surface)	Implement inner corridors, extra holes in floors, bay windows, new large windows; ask for dispensation
	28	Bad/dangerous support structure	Reconstruction; extra reinforcement, steel, gunned concrete, assistant construction; fire resistance
	29	Limited carrying capacity or bad foundation	Reconstruction (extra piles, foundation)
	30	Insufficient carrying capacity for vertical building extensions	Implementation of lightweight construction (steel or timber frame) for new floor levels
4. Legal	31	Presence of asbestos; costly removal by requirements	Negociation lower selling price, demanding asbestos free declaration by seller of building
	32	Restrictions possibilities by (local) regulations	Dispensations: outer space, ceiling height, entrance/access, daylight, insulation
	33	Uncertainty/vagueness about building permittance	Early local communication about demands and information to be delivered
	34	Insufficent imbedding fire safety requirements	Early local communication about (access, fire escape routes, etc.)
5. Financial	35	Building difficult to buy/acquire	Step by step purchase; at first ground lease, in a later stage poseesion; collective purchase with other stakeholders
	36	Large investment in initial phase (advisors,feasibility study)	Financial feasibility study
	37	Difficult feasibility (f.i. building is too small)	Analysis of extension possibilities; combinations with other (commercial) stakeholders; search for subidies
	38	Risk of vacancy; impoverishment (f.i. long lasting development)	Limitation of vacancy period through temporary let of (parts of) building

8.4 Lessons learned from case studies

8.4.1 Applicability of the Conversion Meter in practice

Various versions of the Conversion Assessment Potential tool have been used in many case studies, to explore its applicability and options for further improvement, to investigate the conversion potential of the building(s) , and to explore which opportunities and risks come to the fore in practice. The checklists showed to be well applicable. No missing factors came to the fore. However, the predictive power of the conversion potential score is limited. Some cases with a low conversion potential according to the criteria were converted successfully, whereas some cases with a high conversion potential score were not converted due to too insurmountable obstacles. In cases with a high conversion potential score some risk factors frustrated actual conversion.. These findings confirm that the scores of 0 (No) or 1 (Yes) per criterion and the allocated default weights that were mentioned in section 8.3 (on location and building level) can be different in practice, dependent of the local context. It can happen that the cultural value of a vacant building or a misfit with the current parking standard weight much higher or show to be veto criteria in the success or failure of intended adaptive reuse (Remøy, 2014, Baker, 2017). On the other hand, a number of veto criteria in the first version of the tool were found to be too stringent, such as a project size of less than 20 dwelling units (2000 m2), a building being still partially occupied, duration of vacancy of less than three years, or an building age of less than three years. In later versions of the Conversion Meter these former veto criteria were skipped or moved to the gradual criteria.

8.4.2 Adaptability

Market developments show increased demands for flexibility and sustainability by users and owners as well as a growing understanding of the importance of a circular economy. A direct connection can be made between adaptive building and sustainability (Wilkinson, 2011). The longer a building is kept in its function instead of becoming vacant or being demolished, the more sustainable that building will be. The more flexible a building is, and the more able to adapt to changing user demands, the longer it will keep its function, and the better the total costs of life cycle will be (Hermans, 2014). 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).

8. 4.3 Opportunities and risks found in 15 Dutch cases

Remøy and Van der Voordt (2014) tested 15 cases on conversion potential 'from offices to housing' by using the Transformation Meter version 2.0. In their analyses some recurring opportunities and risks came to the fore and are discussed below.

8.4.3.1 Opportunities

The short development time-span from the first sketch till delivery of the apartments was considered an opportunity. One project took just two years from the first sketch to completion. While still working on the design, the building was stripped to structural frame, stairs and elevator. Not only was time saved because the main structure was already there, and because of this, fewer days were lost due to bad weather. The "WYSIWYG-factor" contributed to this advantage: 'What You See Is What You Get'. In many cases, display apartments were furnished before the reconstruction started. Whereas most people cannot interpret architectural drawings, display apartments inform potential buyers better and boost sales. Financial feasibility was improved by selling the apartments before construction started, leading to lower financing costs and risks. Moreover, in various cases conversion costs were lower than a demolition and new-build. The conversion costs varied considerably. High conversion costs were caused by high-quality demands for the external and internal finishing and high demands for comfort by the target group (acoustic and thermal insulation). Low conversion costs were accomplished when few changes were made to the facades (i.e. student housing) and when the floor-plan was easily adaptable.

The conversions studied received few objections from neighbours. Redevelopment was thought positive in the cases of a building in an area with high vacancy and dilapidation. This added to the developers and investors opportunity to increase the financial feasibility of a project. Finally, conversion of vacant offices was considered a sustainable alternative to demolition and new build, saving building materials and transportation, and producing less waste than demolition and new construction. A frequently heard argument for demolition is that older buildings are not sustainable. However, the performance of the case study buildings was adapted to the Dutch building code and to the level of comfort expected by the relevant user group. Table 8.11 summarises the key opportunities found in the Dutch cases.

Table 8.11: Conversion opportunities in 15 Dutch case studies

ASPECT	OPPORTUNITIES
FUNCTIONAL	
	1 Sufficient parking places
	2 Existing floor plan easily adapted
	3 Extra "left-over space", not available in new developments
CULTURAL	
	4 Historical value, strong architectural appearance
	5 Positive impact on surrounding area
TECHNICAL	
	6 Reuse of large parts of existing building (facade and construction)
	7 Strong floors, possible to add extra weight
	8 Strong foundation, vertical extension possible
LEGAL	
	12 New function fits zoning plan
	13 Conversion preferred by neighbours
	14 Measures fit with building code requirements
FINANCIAL	
	9 Low purchasing price
	10 Preselling implies lower financing costs
	11 Commercial activities in plinth (ground level)

8.4.3.2 Risks

Asbestos
Asbestos was found in seven of the fifteen projects. Asbestos removal follows strict rules and incurs high costs. In all the projects, asbestos removal was accounted for in the building assessment. In a few cases, apartment sales were challenging; in one case, luxury apartments without private outdoor space and with incidentally low ceilings (not according to the building rules) were sold only after the prices were lowered significantly. In another case, apartments with daylight from the north only, were not sold for the initial asking price. The characteristics of these apartments clearly did not correspond to the preferences of the target group. Even in a tight housing market, quality and willingness to pay was found to correspond, especially in the top segment of the housing market.

Discrepancies between drawings and construction
Three out of five buildings constructed before 1950 and three of the five buildings constructed between 1950 and 1965 were not built according to drawings and the construction materials and measurements were different per floor. This was explained as, in the first years after the Second World War, housing was prioritised over commercial buildings in the Netherlands. It was difficult to get building materials, and in many cases contractors used the material they could find without altering the drawings. Buildings constructed after 1965 showed no such differences.

Quality of construction
In one of the 15 projects only, the main structure was in an unsatisfactory state. The concrete in the external columns was deteriorating; hence it was repaired and reinforced. This repair added extra costs to the project, but as a result of the repairs the columns became wider, and the design needed modification. In other projects, light concrete deterioration and steel corrosion was found but required only minor repairs. In most cases, this kind of technical problems was assessed in the preliminary phase. Office buildings are constructed to carry more weight than housing, and in most cases, additional floors could be carried by the existing structure.

Facilities
Apartments require more vertical shafts for electricity, water and plumbing than offices. In the buildings constructed before 1965, floors were penetrated and shafts were placed without problems. After 1965, pre-stressed concrete was commonly used, making larger spans possible. The problem of pre-stressed concrete though, is that it loses strength when the steel is cut. In three of the five buildings constructed after 1965, pre-stressed concrete was used.

Structural grid
The measurements of the structural grid in buildings constructed before 1965 were small and came with thin, light floors. Though these floors are strong, acoustic insulation was poor and needed improvement to meet modern standards and was achieved by adding floating floors and suspended ceilings. The Dutch building code requires better thermal and acoustic insulation of the facade for housing than for offices. Buildings from the 1980s onwards have double-glazing. The thermal insulation of the facade is sufficient for housing; but the acoustic insulation is often not. The facades were replaced in eight of the buildings. In seven projects, the thermal and acoustic insulation of the facades was improved; in five of these it was not possible to change the facade because the buildings were listed monuments.

Zoning plan
In several cases the zoning plan and the municipality not allowing for exceptions was considered a problem. Long lasting procedures slow the process and delay income, threatening the financial feasibility. In most projects however, the municipality was quite co-operative because conversion into a well-functioning building was found to improve the image of the environment and reduce risks of vandalism and feelings of fear.

Technical risks
Most of the revealed risks were technical. Several influence the financial feasibility. A lowered ceiling and floating floor were placed; constructions were repaired, shafts cut through reinforced concrete floors and legal procedures were fought, before permits were obtained. But the conversion costs rose as a result. Developers who were interviewed complained about overrun budgets and too many hours spent to develop specific solutions to problems that occurred during the construction. Still, the projects were financially feasible. Table 8.12 summarises the most striking risks found in the Dutch cases.

Table 8.12: Risks found in 15 Dutch cases

ASPECT		RISKS
FUNCTIONAL		
	1	Present grid does not fit with measurements required for new purposes, resulting in waste of space or costly adaptations of the technical structure
	2	Private outdoor space impossible
CULTURAL		
	3	The appearance of the building does not fit with the required appearance of the new function
TECHNICAL		
	4	Incorrect or incomplete building structure assessment
	5	Poor state of the main structure/foundation (rotten concrete or wood, corroded steel)
	6	Insufficient shafts available; construction allows no extra shafts being made
	7	Insufficient thermal and acoustic insulation in the floors and facades
	8	Insufficient daylight for housing
LEGAL		
	9	Zoning law: Impossible to meet municipal requirements, zoning law, city policy
	10	Building code: Impossible to meet requirements e.g. regarding noise-level and fire-precautions, the municipality is unwilling to cooperate
	11	Monumental act. The monumental status does not allow adaptations that are required to match future user needs.
FINANCIAL		
	12	Development costs: slow handling of procedures (loss of income, high interests)
	13	Vacancy: failing incomes from exploitation or sale of the apartments
	14	Owner not willing to sell for a reasonable price due to high book value

8.5. Concluding remarks

Although the Conversion Meter has been developed to assess the conversion potential of vacant office buildings and conversion to housing, many follow-up studies have shown that the underlying principles and criteria are applicable to other types of conversion well, with some minor adaptations.

For assessments of the conversion potential of office buildings to hotels see for instance: (Divendal, 2013); to health care facilities: (Hummel, 2008) and (Remøy, 2011); to a combination of new functions: (Hek, 2004). Assessments of the conversion potential of other buildings than office buildings have been conducted as well, for instance regarding adaptive reuse of bank buildings (Jongeling, 2006), churches (Schrieken, 2000, Van der Vlist, 2004, Velthuis, 2007, De Beun, 2015, De Jager, 2014), asylum centres (Vaziri, 2008), industrial heritage (Ball, 2002, Scheltens, 2009, Kiroff, 2015, Petković-Grozdanovića, 2016), cultural heritage such as monuments (Wrigley, 1998, Zimmerman, 2001, Van Beers, 2007, Schunselaar, 2009, Bouwer, 2008, Plevoets, 2011, Bullen, 2011, Yung, 2012, Vervloed, 2013, Kloek, 2015, Dyson, 2015, Misirlisoy, 2016, Van Bree, 2011), retail (Van der Wal, 2015), old people's homes (Gelinck, 2013). For assessments of temporary adaptive reuse see for instance (Boer, 2004), (Van der Voordt, 2007) and (Bruijning, 2016). For assessments of adaptive reuse on portfolio level see for instance (Remøy, 2013) and on area level: (Smit, 2007a), (Van Velzen, 2013) and (Chen, 2017).

Figure 12: Utrecht, de Zusters (The Sisters)

Example of a temporary conversion of a vacant office building into a care home, while the care organisation was preparing a new building elsewhere. After conversion the building accommodates 114 care apartments, a recreation area, a library, medical support facilities and a social-cultural neighbourhood centre. A stimulating factor to convert was the need for housing with care in this neighbourhood. Hindering factors were the different languages of care organisations, developers, and the construction industry, lack of skills to test building plans on financial feasibility, and a rapidly changing governmental policy regarding how to finance housing with care; source: (Remøy, 2011)

Next steps

The Conversion Potential Assessment Tool has been developed for use in a Dutch context. A next step is to examine its applicability and related data in other countries. Further testing of the new Conversion Meter in current Dutch cases is relevant too. Additional case studies in the Netherlands and in other countries will provide a better insight in the impact of national and local legislation and the economic and cultural context. The same counts for the financial feasibility scan (Step 4) and financial ratios.

A broader analysis with more case studies may further increase the validity of the tool and reliability of cost data. Financial benefits by rental income or purchase prices should be elaborated for other types of conversion, both regarding the current function (not only offices) and the function after adaptation (other than housing). It would be interesting to include the costs and benefits (including environmental criteria) of alternatives such as demolition and new construction in the feasibility scan as well (Barrett, 2009, Watson, 2009, Wilkinson, 2014, Conejos, 2015). The Checklist could be extended with extra risks that may appear from additional project analysis or interviews with parties who have practical experience with conversion projects.

The practical applicability of the Conversion Meter may be improved by digitising the tool and by adding photos, sketches and boxes with lessons from case studies to illustrate the criteria and risks checklist. Another topic is to explore the need for extra modules looking at particular issues such as sustainability (see for instance (Mohamed, 2017). Finally, the criteria could be linked to tools for adaptable buildings in order to make future conversions functionally and technically more simple and less expensive (see for instance Remøy et al., 2011; Geraedts, 2016). Buildings that support the possibilities of adaptive reuse are more ready to change and make it easier to cope with an ever-changing real estate market and as such will contribute to a more resilient built environment (Hassler, 2014).

References

AVIDAR, P., HAVIK, K. & WIGGER, B. 2007. Gentrification: stromen en tegenstromen. *Oase,* 73**,** 9.

BAKER, H., MONCASTER, A., AL-TABBAA, A. 2017. Decision-making for the demolition or adaptation of buildings. *Proceedings of the Institution of Civil Engineers - Forensic Engineering.*

BALL, R. 2002. Re-use potential and vacant industrial premises: revisiting the regeneration issue in Stoke-on-Trent. *Journal of Property Research* 19(2)**,** 18.

BARRETT, K. J. 2009. The key issues when choosing adaptation of an existing building over new build. *Journal of Building Appraisal,,* 4(3)**,** 9.

BENRAAD, K. & REMØY, H. 2007. Belevingswaarde. *In:* VAN DER VOORDT, T., GERAEDTS, R., REMØY, H. & OUDIJK, C. (eds.) *Transformatie van kantoorgebouwen thema's, actoren, instrumenten en projecten.* Rotterdam: Uitgeverij 010.

BLANKSMA, A. K. 2013. Possible future role for architects and developers in reuse. Delft: TU Delft.

BOER, K. 2004. Tijdelijk wonen in kantoren. Delft: TU Delft.

BOUWER, D. 2008. Een maatpak of toch confectie?: De invloed van de monumentenwetgeving op de transformatie van beschermde monumenten. Delft: TU Delft.

BRAND, S. 1994. *How buildings learn; what happens after they're built,* New York, Viking.

BRUIJNING, S. 2016. Is temporary the new permanent? A research into the temporary use of vacant real estate. Delft: TU Delft.

BULLEN, P. A., LOVE, P. E. D. 2011. Factors influencing the adaptive re-use of buildings. *Journal of Engineering, Design and Technology,* 9(1)**,** 14.

CHEN, Y. J. H. 2017. Evaluating the adaptive reuse potential of buildings in conservation areas. *Facilities,* 29(5)**,** 11.
CONEJOS, S., LANGSTON, C., SMITH, J., LAVY, S. AND LAI, J.K. 2015. Enhancing sustainability through designing for adaptive reuse from the outset: a comparison of adaptSTAR and Adaptive Reuse Potential (ARP) models. *Facilities* 33(9/10).
DAMWIJK, R. M. 2015. Comparing Adaptation and Demolition & New Build for office buildings in the newly developed ADNB Indicator. Delft: TU Delft.
DE BEUN, E. A. 2015. Geloof, Hoop & Samenwerking. De HerbestemmingsGAME voor Religieus Erfgoed. Delft: TU Delft.
DE JAGER, J. 2014. Sint Josephkerk in Amsterdam West: Herleving van het hart van de wijk. Hergebruik-opgave van een kerkgebouw in Amsterdam West. Transformatie naar wijkcentrum voor de hele buurt. Delft: TU Delft.
DIVENDAL, N. 2013. Hotels for vacant offices. Delft: TU Delft.
DOUGLAS, J. 2006. *Building adaptation,* Oxford, Butterworth-Heinemann.
DYSON, K. M., J. , LOVE, P.E.D. 2015. Critical Success Factors of Adapting Heritage Buildings: An Exploratory Study. *Built Environment Project and Asset Management* 6(1)**,** 14.
GELINCK, S., VAN ZEELAND, H., VAN DIJK, G., 2013. TransformatieWijzer: van kantoor naar woonruimte. Perspectief, financiën en regelgeving. *In:* BOUWRESEARCH, S. (ed.). Rotterdam: Stichting Bouwresearch.
GERAEDTS, R. 2004a. Transforming Empty Office Buildings into Homes. *International Workshop Tokyo Metropolitan University.* Tokyo: Tokyo Metropolitan University.
GERAEDTS, R. 2016. FLEX 4.0, a practical instrument to assess the adaptive capacity of buildings. *Energy Procedia,* 96, 2016**,** 12.
GERAEDTS, R., VAN DER VOORDT, D.J.M. 2002. Transforming Offices into Homes. *CIB W104 Open Building Implementation, Balancing Resources and Quality in Housing.* Mexico City: Mexican Institute of Architects, The Housing Institute of Mexico City, Universidad Autonoma Metropolitana (UAM); the Universidad Iberoamericana; Habitat International Coalition, and TAVI.
GERAEDTS, R., VAN DER VOORDT, D.J.M. 2007. The New Transformation Meter; A new evaluation instrument for matching the market supply of vacant office buildings and the market demand for new homes. *Building Stock Activation 2007.* Tokyo.
GERAEDTS, R., VOORDT, D.J.M. VAN DER 2014. Transformation Meter New; version 17-3-2014. *In:* DELFT, T. (ed.). Delft: Faculty of Architecture, Department of Real Estate & Housing.
GERAEDTS, R. P. & VAN DER VOORDT, D. J. M. A Tool to measure opportunities and risks of converting empty offices into dwellings. *In:* BOELHOUWER, P., GROETELAERS, D., OUWEHAND, A. & VOGELS, E., eds. OTB. Workshop W 11 – Metropolitan dynamics: Urban change, market and governance. ENHR International Conference on Sustainable Urban Areas, 25-28 June 2007 2007 Rotterdam. 21.
GERAEDTS, R. P., VAN DER VOORDT, D.J.M. 2003. Good Buildings Drive out Bad Buildings; an instrument for defining the lower end of the office market; transformation into homes. *In:* HONG KONG, A. H. (ed.) *CIB W104 Open Building Implementation, Dense Living Urban Structures.* Hong Kong: HKU.
GERAEDTS, R. P., VOORDT, D.J.M. VAN DER, VRIJ, N. DE 2004b. Transformation Meter Revisited; Three new evaluation instruments for matching the market supply of vacant office buildings and the market demand for new homes. *The 10th Annual Conference CIB W104 Open Building Implementation, Open Building and Sustainable Environment.* Paris: CIB W104.
HASSLER, U., KOHLER, N. 2014. Resilience in the built environment. *Building Research & Information* 42 (2)**,** 11.
HEK, M., KAMSTRA, J., GERAEDTS, R.P., 2004. *Herbestemmingswijzer; herbestemming van bestaand vastgoed; Transformation Guide; transformation of existing real estate,* Delft, Publikatieburo Bouwkunde.
HENDERSHOTT, P. H. 1996. Valuing properties when comparable sales do not exist and the market is in disequilibrium. *Journal of Property Research,* 13**,** 57-66.
HERMANS, M., GERAEDTS, R., VAN RIJN, E., REMOY, H. 2014. Determination Method Adaptive Capacity of Building to Promote Flexible Building; Bepalingsmethode Adaptief Vermogen van gebouwen ter bevordering van flexibel bouwen. Leidschendam: Brink Groep.
HORDIJK, A. & VAN DE RIDDER, W. 2005. Valuation model uniformity and consistency in real estate indices: The case of The Netherlands. *Journal of Property Investment & Finance,* 23**,** 165-81.
HUMMEL, B. 2008. Zorg voor Leegstand. Scan ten behoeve van de transformatie van kantoorpand naar woonzorgcomplex. Delft: TU Delft.
JONGELING, N. 2006. Transformatiepotentie van RABO bank kantoren. Delft: TU Delft.
KEERIS, W. 2007. Gelaagdheid in leegstand. *In:* VAN DER VOORDT, D. J. M., GERAEDTS, R.P., REMØY, H. & OUDIJK, C. (ed.) *Transformatie van kantoorgebouwen.* Rotterdam: 010 Publishers.
KIROFF, L., TAN, X. 2015. Adaptive reuse of industrial buildings in a new precinct in Auckland's CBD. *In:* FORUM, G. S. A. T. (ed.) *1st International Conference on Urban Planning and Property Development,.* Singapore.
KLOEK, Y. 2015. Adaptation of State listed monuments: The added value of the architect in the process. Delft: TU Delft.
KOPPELS, P. W., REMØY, H. & EL MESSLAKI, S. The negative externalities of structurally vacant offices: An exploration of externalities in the built environment using hedonic price analysis. *In:* JANSEN, I., ed. ERES 2011, 18th Annual European Real Estate Society Conference, June 15-18, 2011 2011 Eindhoven.
MACKAY, R., DE JONG, P. & REMØY, H. Transformation building costs; understanding building costs by modelling. *In:* WAMELINK, H., ed. Changing Roles, 2009 Rotterdam. Delft University of Technology.
MENSING, A. D. 2014. The re-development value of vacant real estate: A method of analysing the financial feasibility of re-development projects from offices to housing. Delft: TU Delft.
MISIRLISOY, D., GÜNÇE, K. 2016. Adaptive reuse strategies for heritage buildings: A holistic approach. *Sustainable Cities and Society,* 26**,** 8.
MOHAMED, R., BOYLE, R., YANG, A. AND TANGARI , J. 2017. Adaptive reuse: a review and analysis of its relationship to the 3 Es of sustainability. *Facilities,* 35.
MULDER, K. 2015. Tijdelijk bewoond; Temporary Inhabited. Delft.
PETKOVIĆ-GROZDANOVIĆA, N., STOILJKOVIĆ, B., KEKOVIĆ, A., MURGUL, V. 2016. The possibilities for conversion and adaptive reuse of industrial facilities into residential dwellings. *Procedia Engineering,* 165**,** 9.
PLEVOETS, B., VAN CLEEMPOEL, K. 2011. Adaptive reuse as a strategy towards conversion of cultural heritage: a literature review. *WIT Transactions on The Built Environment,* 118**,** 9.
REMØY, H. 2010. *Out of office, a study of the cause of office vacancy and transformation as a means to cope and prevent,.* Dr., TU Delft.

REMØY, H. 2013. A sustainable Real Estate Strategy, Design for Change, Urban Adaptation Strategies. Delft: Delft University of Technology.

REMØY, H., KOPPELS, P. W. & DE JONGE, H. 2009. Keeping up Appearance. *Real Estate Research Quarterly,* 8**,** 6.

REMØY, H. T., VAN DER VOORDT, D.J.M. 2014. Adaptive reuse of office buildings: opportunities and risks of conversion into housing. *Building Research & Information,* 42**,** 9.

REMØY, H. T., VAN DER VOORDT, D.J.M. 2011. Zorg voor leegstand. Herbestemmen van leegstaande kantoren naar zorggebouwen; transformation of vacant office buildings to health care buildings. Amsterdam: BNA, TU Delft.

SCHELTENS, A. 2009. Sleutels voor succesvolle transformaties bij verouderde industriële gebouwen. Een onderzoek naar de rol van concept en financiële haalbaarheid. Delft: TU Delft.

SCHRIEKEN, B. J. 2000. Geloof in transformatie. Delft: TU Delft.

SCHUNSELAAR, T. 2009. Transformatie van beschermde monumenten. Delft: TU Delft.

SMIT, A. J. 2007a. Transformatie van verouderde bedrijventerreinen. *In:* VAN DER VOORDT, D. J. M. (ed.) *Transformatie van kantoorgebouwen.* Rotterdam: 010.

SMIT, A. J. 2007b. Transformatie van verouderde bedrijventerreinen. *In:* VAN DER VOORDT, T., GERAEDTS, R., REMØY, H. & OUDIJK, C. (eds.) *Transformatie van kantoorgebouwen thema's, actoren, instrumenten en projecten.* Rotterdam: Uitgeverij 010.

TEN HAVE, G. G. M. 1992, 2002. *Taxatieleer onroerende zaken,* Leiden, Stenfert Kroese.

VAN BEERS, B. J. 2007. Cultuur-historische waardemeter. *In:* VAN DER VOORDT, D. J. M. (ed.) *Transformatie van kantoorgebouwen.* Rotterdam: 010.

VAN BREE, C. P. R. 2011. Monumenten in stadsvernieuwingen; van verliezers op het eind naar winnaars aan de start. Delft: TU Delft.

VAN DEN BERG JETHS, A. 2013. Self-sufficient working-living environments, prospects for office areas with structural vacancy: Plaspoelpolder (Rijswijk, Zuid-Holland). Delft: TU Delft.

VAN DER VLIST, N. 2004. Geloofwaardige transformatie. Delft: TU Delft.

VAN DER VOORDT, D. J. M., VAN DER KOLK, M. 2007. Tijdelijk transformeren. *In:* VAN DER VOORDT, D. J. M. (ed.) *Transformatie van kantoorgebouwen.* Rotterdam: 010.

VAN DER WAL, L. 2015. Retail vacancy in inner cities: The importance of area and object characteristics. Delft: TU Delft.

VAN VELZEN, J. 2013. De gebiedsgenerator voor kantoorlocaties. Delft: TU Delft.

VAZIRI, P. 2008. Transformatiepotentie van de opvanglocaties van het Centraal Orgaan opvang asielzoekers voor andere woonfuncties. Delft: TU Delft.

VELTHUIS, K., SPENNEMANN, D.H.R. 2007. The future of defunct religious buildings: Dutch approaches to their adaptive re-use. *Cultural Trend,* 16(1)**,** 14.

VERVLOED, T. 2013. Herbestemming van rijksmonumenten. Delft: TU Delft.

VRIJ DE, N. 2002. Measuring is knowing. Delft: Delft University of Technology.

WATSON, P. 2009. The key issues when choosing adaptation of an existing building over new build. *Journal of Building Appraisal* 4**,** 9.

WILKINSON, S. J. & REMØY, H. Sustainability and within use office building adaptations: A comparison of Dutch and Australian practices. *In:* ANDERSON, K., ed. Pacific Rim Real Estate Society, 2011 Gold Coast. Gold Coast: Bond University.

WILKINSON, S. J., REMOY, H. Sustainability and within use office building adaptations: A comparison of Dutch and Australian practices. Pacific Rim Real Estate Society Conference, 2011. Gold Coast, Qld.: Pacific Rim Real Estate Society; Bond University AUS.

WILKINSON, S. J., REMØY, H., AND LANGSTON, C. 2014. Chapter 6. Reuse Versus Demolition. *Sustainable Building Adaptation. Innovations in decision-making.* London: John Wiley & Sons.

WRIGLEY, M. J., HUGHES, R.H. 1998. Assessing the development potential of historic buildings - a case study. *Journal of Property Valuation & Investment* 16(3)**,** 11.

YUNG, E. H. K., CHAN, E.H.W. 2012. Implementation challenges to the adaptive reuse of heritage buildings. Towards the goals of sustainable, low carbon cities. *Habitat International,* 36**,** 10.

ZIMMERMAN, A., MARTIN, M. 2001. Implementation challenges to the adaptive reuse of heritage buildings: Towards the goals of sustainable, low carbon cities. *Habitat International,* 36(3)**,** 10.

Note 1:

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Note 2:

The Conversion Meter may be used for free. Your experiences or comments are welcome at the authors of this chapter.