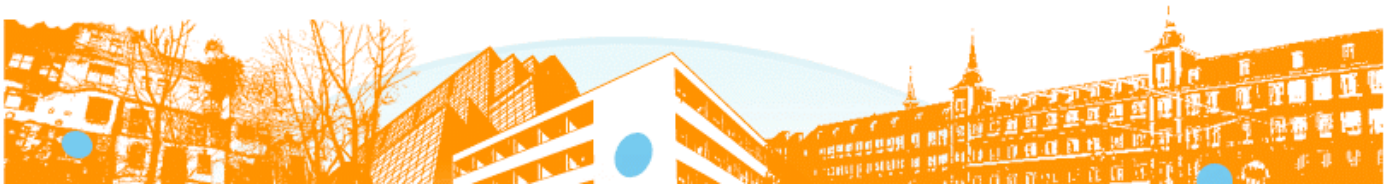

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Adaptive Reuse in Brussels and Copenhagen

The capacity of the existing building stock to meet new functional needs

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Abstract

Cities constantly evolve under the pressure of socio-economic changes. As flexibility is one of the buzzwords of our time, one can ask himself what kind of effect this will have on the rigidity of our built fabric? This study investigates the capacity of Brussels and Copenhagen to adapt and reuse their built fabric for other purposes (=adaptive reuse). Adaptive reuse has positive environmental and social effects on it's surroundings and is a sustainable way to meet the changing needs of a city.

The study is formed around a comparative research of the tensions between the different actors, institutional-, physical- and market-contexts of Brussels and Copenhagen. The methods used during this research consists of a literature research studying the conditions wherein adaptive reuse has to act, followed by an empirical analysis of adaptive reuse for the three most important functions: housing, office and industry. This will allow to make an assessment on future reuse and, where data allows it, make a geographical impact analysis. An analysis of the actors furthermore enables to give an insight into possible policy measures to support the sustainable process of adaptive reuse.

This study will prove that adaptive reuse carries an important capacity to guide the functional change of cities without having much support from authorities, it furthermore confirms that the historical city centres carry the physical characteristics to further guide the process of adaptive reuse.

Adaptive Reuse in Brussels and Copenhagen

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1.Introduction

1.1. Flexible Cities ?

Flexibility is one of the buzzwords of our time. Fast technological development together with the rising interconnectivity speeds up processes and creates tensions within society. One of the outcomes is the creation of the flexible society, where new organisational structures, flexible employment arrangements, novel working practices and changing demands for transport facilities are rapidly emerging (Hinds, 2003). The nature and pace of these changes inevitably alter the structure of cities (Kincaid, 2002) and exacerbate social polarisation between the rich and poor (Kesteloot, 2007). But how far does this concept of flexibility influence the structure of our cities?

There are many different ways of looking at the flexibility of cities. From the design of new and existing buildings, to the transportation, communication and other infrastructure, all can be researched on their level of adaptability and flexibility (Heath, 2001). One aspect jumps out when it comes to discussing its complexity: the flexibility of existing buildings between functions. While the flexibility of squares, transportation and services are primarily controlled by the state; buildings to a large extent are the product of the citizens wishes themselves.

Flexibility of cities here is approached through a focus on adaptive reuse, a process where an existing building changes function without demolishing the core structure of the building. It is flexible as a change back and forward is possible. Hereby adaptive reuse distinguishes itself from other urban changes, which can also happen by solely destroying and reconstructing the infrastructure to supply new demands.

The constantly changing spatial arrangements of cities under inter and intra urban competition are calling for adaptive reuse (Massey, 1978;1979). In some cases there is a persistence of social and functional configuration, like the inner city working areas that since industrialisation remained the house of many labourers until the start of Fordist period when suburbanisation took off (Kesteloot, 2007).

These tensions not only could change the social classes who were using them, but moreover fundamentally were able to alter the use of buildings. Turning old industries into loft apartments is a nice example of a functional change under the power of socio-economical change. Another example are the old mansions in the city centre, which could be adapted to become office-space. These kind of changes are nicely described by Scott (2008:17):

> “In the city, uses and occupations migrate from quarter to quarter in quantum shifts; the on-time brothel becomes software offices, the soap factory becomes artists studios (Scott, 2008;17).”

There are plenty more stories where one sees a building being converted into a never expected function, but how does a building become subject to a change of function? At one stage in life buildings undergo the process of becoming obsolete for their present use. This can be a physical or economical obsolescence. The buildings structure and services are deteriorated for its present function, the size cannot be sufficient anymore, the use does not fit the social class in the surrounding or another use has become more competitive for the location, etc... After becoming obsolete there are several thresholds for a building to be reused and house a new function.

Though when these are met, there is an array of positive impacts on its environment. Adaptive reuse first of all considerably extents the life span of a building. Hereby it helps to achieve a whole range of economic (saving building materials) and environmental goals (saving greenhouse gasses), an opinion much shared by Tim Heath (2001), Rudlin and Falk,(1999) the Department of the Environment (1996), URBED (1998) and the Urban Task Force (1999). It furthermore also has positive social impacts by keeping the memories of a society alive. Adaptive re-use moreover promotes urban intensification by allowing a mix of uses to re-enter mono-functional districts (Heath, 2001).

Still it is important to recognise that city centre regeneration through conversion of buildings can also pose a threat. Relentless housing expansion by converting other uses into housing, can lead to too much replacement of commercial and/or leisure facilities. This is most likely where the economic circumstances are less buoyant and land values for these supporting activities are more depressed. “When there is displacement and decentralisation of activities, residentialisation can fail to be an effective sustainability strategy for the local economy” (Bromley et al., 2005: 2425). The conversion of larger blocks furthermore may result in too high residential densities that have significant implications for building management and unacceptable pressure on local amenities (Gann and Barlow, 1996). A flexible urban environment therefore can offer a lot of opportunities, but at the same time can pose some threats and conflicts.

Urban management and planning decisions must be based upon maximum information on the characteristics and special features of a city(The European Urban Charter,

2003). Knowing that change is inherent to cities and resources are not endlessly available, studying the possibilities of adaptive reuse may open up new ideas for urban policies. Giving existing buildings a new function is of great relevance for the problems of the today's cities, which suffer under vacancy and mono-functionality, two problems adaptive reuse might mitigate against. Above this, in the developed world more money is being spent on changing buildings than on building new ones (Brand, 1994), having sufficient knowledge about adaptive reuse therefore is of uttermost importance if local governments want to continue guide city development.

Studies have been made on adaptive reuse, but this study will go deeper into several aspects via a geographical and comparative approach. This research will investigate the capacity of adaptive reuse to supply new functional needs. Hereby not only the idiosyncratic characteristics of adaptive reuse and actors will be addressed, but also the environments and common characteristics of adaptive reuse will be investigated. This is possible via a comparative study of the historical districts of two European cities; Brussels and Copenhagen. Both cities governed their historical districts in a structurally different way. The office real estate sector in Brussels thoroughly changed the look of the central district while Copenhagen has a well preserved historical city centre. Copenhagen moreover is known as one of the most expensive cities in the world to live, while Brussels has a relatively cheap housing market if one compares to other European Capitals (Coppens, 2010). Brussels moreover has a tension between the expensive international office market and the cheaper local housing real estate sector (Dirckx et al, 2009). These contrasts will have an influence on the dynamics of adaptive reuse.

1.2. Structure of research

The research starts with the further elaboration of the research question. Hereby additional information on the concept of adaptive reuse will be given and structured in the present-day context. In example, what are the advantages of adaptive reuse over new constructions? During the methodology light is shed on the methods and case studies used during the research.

Following the framework of research, a study on the most important conditions and actors examines the factors that are promoting and constraining the process of adaptive reuse. This will help to understand the centrepiece of research: the study on the case studies of Brussels and Copenhagen. The research consists of a four-tier analysis: (1) an ex-

amination of the legal framework gives an idea of the theoretical flexibility of the city. How are building prescriptions, spatial planning policies and land-use plans influencing adaptive reuse in both cities? (2) an empirical analysis of adaptive reuse in the historical city centres of Brussels and Copenhagen. Hereby the capacity of adaptive reuse will be quantified and localised for both case studies. (3) A further outlook for adaptive reuse is made in the third tier of research. (4) A short investigation into the different actors who are active in adaptive reuse will complete the research and enables to envision future policies.

The aim of this research is to find out to which extent cities functionally evolve via the use of adaptive reuse. Hereby the tension between the theoretical and actual reuse is uncovered. This study will prove that adaptive reuse carries an important capacity to guide functional change of cities without having much support from authorities, it furthermore confirms that the historical city centres carry the physical characteristics to guide the process off adaptive reuse.

2. Acknowledgements

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3.Research Question

The central research question of this thesis is: What is the capacity of the existing building stock to be adapted to new functions in order to meet the new functional demands of Brussels and Copenhagen?

The research question is based on the idea that Copenhagen and Brussels are constantly undergoing a functional change whereby certain functions are decreasing and others are rising in importance. The question of this thesis looks if functionally adapting and reusing obsolete buildings might be a solution to meet these new needs.

3.1. Clarifying terms of research:

The **capacity** is determined by the ability of the actors to adapt and reuse existing buildings together with the physical characteristics of buildings that (dis)allow a change of function. By comparing the rate of adaptive reuse with the amount of new constructions, the capacity of adaptive reuse can be proven.

City centres are distinctive places in cities (Gruen, 1964; Whyte, 1988; Gratz & Mintz, 1998; Rypkema, 2003 cited in Balsas, 2007: 234). Normally they coincide with historic districts and are forums for civic life, but their main characteristic is that they are multifunctional places (Kincaid, 2002). It is this organic mix of activities together with an intense daily use that makes the city centre an interesting place to study adaptive reuse, as there is a competition between different activities to be located here. The research focuses on the historical city centres of Brussels (=municipality of Brussels) and Copenhagen (=first district in Copenhagen, Indre By). Also its surrounding districts are taken up into the research for comparative and practical reasons as data is not always available on municipal or district level. A research stretching the whole municipality of Copenhagen and the Capital Region of Brussels furthermore allows the investigation of intra city trends.

Adaptive reuse means using parts of the whole structure of an existing building and giving it a new function which differs from its previous use. “Typical five kinds of uses are defined” (Kincaid, 2002; 5): Residential, retail, office, warehouse-industry and others (Hotels, Public functions).In this thesis most observations will be linked with the interaction between residential, office and warehouses-industrial buildings. Functional reuse is synonymous to adaptive reuse and from now on can be abbreviated to reuse.

Adaptive reuse offers disused buildings an alternative to preservation or demolition by giving them a new function and keeping it inhabited, occupied, ... an existence beyond

their time (Scott, 2008). The concept of reuse is highly connected to human society, however for a brief time of history it did not fit in. This period was the time of the functionalist paradigm, which was ruling for a large part of twentieth century. During functionalism buildings were conceived in a particular framework and they were thought of not leaving it in their lifetime (Scott, 2008). Except perhaps for a few exceptions, buildings during functionalism either fulfilled their purpose or were demolished.

Functionalism had the idea of bringing stability to society, in present society this concept cannot work anymore as functionalism cannot deal with future uncertainties as “form follows function”.

Adaptive reuse opens up a world of fantasy, like having your office in an old mansion or going on holiday in an old church. Reuse keeps buildings telling their old story and ads a new one, it is like the geological metaphor on a micro scale. All previous functions leave their mark and will influence the next function. The history of a building might engender some kind of surprise and even self-reflection among present day users. After all this positive lighting of reuse, one cannot forget that ruination is inherent to the art of intervention, and not merely as an expedient, required by building practices an client requirements (Scott, 2008: 95). If ruination is part of the process, why reuse a building then?

3.2. New construction as alternative to reuse

The alternative to an adaptive reuse is replacement by a total new construction, where the old one is demolished. The reasons for demolition are complex and do not correlate with the age or the state of the buildings (Golton, 1997; Kohler & Hassler, 2002). Ironically, buildings are considered to be in a bad state because their owners want to demolish them (Kohler & Hassler, 2002). Instead, reasons for demolition are predominantly functional and formal obsolescence and rising land values.

New buildings have the advantage of meeting the client needs in the most effective way. Functions can be planned with minimal waste of space and a full use of 100 %. Reusing an existing building means that the function will not fit the building tightly. A typical example are the offices in older buildings. These buildings are divided into rooms by solid supporting walls, creating spaces that are sometimes too large to fit one office and too small to fit several. Modern offices, on the other side are open planned offices, which have no supporting walls. Walls therefore can be placed and moved to fit client needs. Offices in brick supported buildings therefore need 20-35% more space to get the same amount of

functionality as in new built-to-suit ones. This extra space represents an extra rent that companies are not always willing to pay. For example, if one needs a 10.000 sqm office building, a reuse of an existing brick building might need up to 3500 sqm more than a new building without adding extra usable space (interview Anderson).

A new construction moreover offers the possibility to maximise profit as in a reused building developers have to work within an existing frame and do not always have the opportunity to make extensions and develop the maximal allowed surface. On the other side a fit to use is not available for everybody as there is not enough building capacity to serve everybody instantly. For the UK case, changes in the quantity and quality of buildings over a 5–10 year term mainly have to be accommodated by the existing vacant stock rather than by new-build developments (Kincaid, 2002). This lag is related to the backlash between the changing requirements of users and the conception, construction and final use of a building.

Vacant or partially vacant buildings represent a form of unemployment (Myers and Wyatt, 2004), a study in Switzerland by Wüest (1995) estimated that the unoccupied industrial floor area alone amounted up to 10 years' worth of new construction. In Switzerland adaptive reuse therefore carries a huge capacity. Partially vacant premises moreover are an underestimated phenomenon. For businesses in the United Kingdom alone, the conversion of this space could save up to £18 billion a year (Drivers *et al*, 2003a). Also other kinds of buildings are under utilised, creating a huge potential for conversion to other uses.

The growing calls to limit new construction in favour of improving the existing stock (Graham, 2003; Degreef, 2009) and even to completely stop constructing any additional new buildings in industrial countries (Kohler, 1999) is therefore not a surprise. In developed countries already one can see that construction activity only corresponds to 1,5 - 2% of the existing building stock (Bullen,2007), which means that the replacement level is well above 50 years. Refurbishment, where adaptive reuse is part of it, therefore already plays an important role in keeping the urban structure up to date.

New societal values like sustainability are furthermore calling for adaptive reuse as this circumvents the wasteful processes of demolition and reconstruction (Bullen, 2007).In contrast to new constructions, adaptive reuses can act as living memories of our cities and societies. They keep the narrative of our cities alive and remind to a almost forgotten past. Hence it is no surprise that cultural (68%) and heritage significance (83 per cent) are two

main factors that should be included in the decision process to asses the suitability of a building for adaptation instead of demolition (Bullen, 2007). Recognisable elements create attachment and awareness for citizens and furthermore help to characterise a city (Lynch, 1960).

The adaptive reuse of offices or industrial sites can present an interesting and sustainable solution for meeting rising housing demands in the city (Heath, 2001). Recent trends in Copenhagen and Brussels show a rise in population. Above this, the reintroduction of a residential population stimulates the development of shopping facilities, restaurants and places of entertainment, which would prove highly desirable for the daytime working population as well (Jacobs, 1993). City centre living therefore enhances the viability of all kind of conversions (Heath, 2001) and thus helps revitalising city centres.

In conclusion one can say that adaptive reuse is a sustainable solution when one compares it to new constructions, it furthermore can act as a short-term supplier of needed space and adds a narrative to the city. New constructions on the other side did not loose their role as supplying perfectly suiting solutions. But does this tailoring add to the lifetime and value of a building? A first indication would be no:

> The best buildings are not those that are cut, like a tailored suit, to fit only one set of functions, but rather those that are strong enough to retain their character as they accommodate different functions over time (Campbell & VanderWarker, 1992: 160-161).

This means that new buildings are planned for shorter periods as business horizons shrink with the growing global competition (Bon, 1989). Concomitantly, and for the same reasons, the developments of adaptive reuse projects offer a solution for a short life cycle. Buildings can be kept, while the functions are more prone to change.

As a result of changing opportunities in the marketplace, even major decisions such as choosing the ultimate use for a refurbished building may change. Projects almost never follow a simple logical sequence of decisions from acquisition through design and construction to marketing, as might, sometimes at least, occur in new-build work (Kincaid, 2002). Even if adaptation is a serious alternative to demolition, it does not help to determine which new use is best suited to a particular building in a particular location at a particular time. How this research will be approached, is a subject for the next chapter.

4.Methodology of research

The introduction already revealed that the study will be elaborated via a four-tier analysis. The basis for this research is lain via a literature study on the conditions and actors that are active in the process of adaptive reuse. A lot of background information and documentation has already been collected on several aspects of adaptive reuse. This will be restructured and outlined to help to understand what and whom is helping or limiting adaptive reused. Physical characteristics, actors, locational factors, even the information on the building stock, all have their influence on the process of adaptive reuse. Each of these factors will be analysed via literature study and will be supported by interviews of which at least five will be conducted in each city. These interviews are used in chapter five to check its compliance with the literature and add extra data. The interviewees are selected on the following basis:

1. **1-2 architects** that have experience with adaptive reuse and can describe local problems with planning laws and ideas around reuse.
2. **1 Promoter/ developer** of a reuse project that describes the motivations for doing a reuse. He furthermore can help to understand possible setbacks and promoters.
3. **1 Local city planner** that allows the permit to do a functional reuse and knows the steps to take during an adaptive reuse.

Interview candidates are scouted via a desktop research on news sites of remarkable projects and via contacts in the real estate sector. After desktop research, contacts are phoned and an interview is requested.

Table 1: Interviewees in Copenhagen:

Person	Function and company	Education
Steen Enrico Andersen	Director of PLH - architects	Architect MAA, Intl. Assoc. AIA
Peter Ebbesen	Technical Director of Sjaelsoe- real estate developers	unknown
Ivar Moltke	Architect - Danish Technological Institute	Architect
Michaela Bruël and Karen Probst	City planners for local plans and senior consultant (Bruël)	Architect Preservation architect
Poul Nielsen	Chief in managing the building permits for Copenhagen	Architect

Table 2: Interviewees in Brussels

Person	Function and Company	Education
Wim Ottevaere	Real Estate Consultant (JLL)	Geographer
Sophie Coekelberghs	Researcher for Review of office property - Department of Land-use planning and Housing	Geographer
Charles MacGregor	Ceo of Benelux Property SARL	/
Roblain Jessy	Commercialisation GOMB	
Unknown - telephonic interview via info-line	Department of urbanism of the city of Brussels	

A comparative study is used as it enlarges the scope on common trends, while it lowers down the changes of being only a descriptive research. As already mentioned, Brussels and Copenhagen have substantial different real estate markets and differ largely on their history in spatial planning. History has shown that the historical city centre of Brussels suffered substantially under modernist planning during the transition to a service economy. Whole neighbourhoods were cut down to make room for office buildings and highways. Copenhagen can almost be seen as the antagonism of Brussels. Although the plans were there, the historical city centre neither has skyscrapers, nor has cut down whole neighbourhoods for office space. Seeing these contrasts, a different evolution in functional reuse can be expected.

Empirical development will focus on a four tier research: (1) an investigation of the institutional framework where adaptive reuse has to work in. Strategic plans, land-use plans, building codes and other can help to determine the institutional framework. Also a desktop analysis of available subsidies or supporting policies form part of this research. (2) a quantitative and geographical analysis of adaptive reuse via the use of data from statistical databanks, regional development agencies and previous made reports on functional reuse in the case studies. The localisation of where adaptive reuse is taking place should allow to make future estimates and understand adaptive reuse in a more thorough way. Therefore a comparison between the city centre and its surroundings is necessary.

Empirical data collected from statistical databanks pose a threat for the research as not all data is giving free. Sometimes data is available, but is protected for privacy reasons, and can only be given in a processed way, costing substantial amounts of money that is not available for this research. When data is not accessible or not satisfying, interviews with key protagonists will be used to gather the trends in adaptive reuse.

As data has to be gathered differently, the empirical studies between Brussels and Copenhagen will differ largely. For Copenhagen functional reuse can be studied via a own calculation, but without the possibility to directly investigate the original function. These trends are therefore underbuilt with interviews. Brussels on the other side has data that allows an analysis of the destinations and origin of functional reuse for office and industry. Brussels moreover offers the possibility to do a precise geographical analysis, while in Copenhagen these trends have to be based on interviews.

(3) A further outlook on conversions will be given based on a own analysis of previous trends and existing reports on functional reuse.

(4)The last part of focusses on finding the major actors who are and can influence the flexibility of buildings. Hereby the interviews with key protagonists and literature on previous adaptive reuse in the case studies are used to uncover the actors active in functional reuse. The differences between both cities may need another approach in controlling and promoting reuse.

To summarise, a literature study, interviews with key protagonists and aggregated quantitative data are used to support the research. Hereby hard factors, visible in figures and rules, and the more latent soft factors, i.e. decisions made by the actors, are being researched together. Though different ways of collecting data are used, a comparison between both case studies still will be possible as general trends will be comparable. The case studies furthermore show a sufficient amount of particularities, but still act in a common Western context, allowing a comparative study to be successful.

5. Conditions and actors in the process of adaptive reuse

The Barriers and Promoters of Reuse

5.1. Physical limitations of the built fabric

The cause of obsolescence is more generally derived from social and economic changes in the wider society, than from physical obsolescence. Though, this does not mean that buildings will allow alteration without any resistance. Obviously there are physical characteristics that restrain interventions. Adaptive reuse contains a set of natural antagonisms, which must be recognised and dealt with if a reuse is going to be a success. It is a clash of established and intended hierarchies of use and space. If a minimum amount of requirements is not met, a reuse cannot be pulled through (Scott, 2008). Gann & Barlow (1996) identified seven generic characteristics that seem to have an influence on the reusability of the offices to flats:

1. the size, height and depth of a building
2. the type of building structure
3. its internal space, layout and access
4. the building's services
5. fire safety measures and the means of escape.
6. the building's envelope and cladding
7. the provision for acoustic separation

A first remark on this list is that physical requirements largely depend on which function they are meant for, as not every function has the same physical requirements to sell easy. A study of Kincaid (2002) showed that retail was the least demanding function when it comes to building characteristics. For retail only building access and location seem to be of major importance. Office-space on the other side desires the most physical characteristics of all functions. They demand the right cladding material, building lay-out, building access, services (like air-conditioning, ventilation, heating system), etc. ... In consequence a reuse away from offices will not be a surprise. In the following paragraphs, the most important physical influences of Gann & Barlow's (1996) list will be further investigated.

A logical question for a reuse scheme seems to be: **does size matter?** Alteration gives the impression of having no limits of scale (Scott, 2008; Cowan, 1963). Cowan (1963) approached the question from a 2-dimensional point of view. He showed that when all sizes of spaces used for a generic set of human activities were plotted against the fre-

quency of occurrence, the peak of the most used surface occurred at only 20 square metres and fell away sharply thereafter as space size increased. In consequence most buildings are physically suitable for adaptation to most uses. Though this happens at a certain economical cost (see 3.2) as function has to follow form, hereby a new function cannot fit the space tightly.

Size does matter if one sees that larger buildings tend to survive longer than their smaller counterparts. Larger buildings are ideal conversion candidates as they allow multiple uses (Hassler et al., 2000). The size of buildings converted during the research of Gann and Barlow (1996), typically ranged between 1000 and 8000 sqm. Also the study done by BRAT (2007) proved that 66.8% of the buildings had a size between 1000 and 5000 sqm. This certainly does not exclude larger buildings of being reused, as one interviewee (Macgregor) witnessed. 8000 sqm was their minimal surface to be profitable in the Belgian real estate market for a conversion of offices to student housing. In conclusion one can say that if it are small, medium or large (>5000 sqm), one rule always goes through: once a building is altered, the chances are it will be altered again and pursue a modern way of life up until its next obsolescence.

When moving to a 3 dimensional point of view, the height of the ceiling becomes an important issue. New living and working standards demand minimal ceiling height of about 2,2-2,5 m (depending on the country). Too low ceilings are very expensive as floors have to be cut down to reach present day standards, otherwise it cannot be used for housing or office (interview Ebbesen). Luckily these kind of situations do not happen that often.

Also natural light is one of the requirements in the building regulations, therefore the depth of the building cannot reach too far. During interviews this was seen of minor influence by one (interview Anderson), a major cost for the other (interview Ottevaere, Coekelberghs). The depth of some old open plan offices is too deep to house dwellings for our present day standards, though it is feasible to manage (Gann and Barlow, 1996).

The initial ‘as found’ condition of **services** has little direct effect on project viability as all building services are usually replaced during adaptive reuse (Kincaid 2002). They wear out of obsolescence every 7 to 15 years and above this a functional change mostly needs another lay-out of services. Services therefore are a more neutral characteristic in enabling reuse.

Structures have to bear down their loads as simple as possible, otherwise design becomes significantly more expensive. Also the **materials** that are used can cause the build-

ing to be less flexible. If it is easy to cut down walls and alter the lay-out, the building stands a better chance to be adapted to a new function. **Larger spaces and an open lay-out** mean it is more easy to put in modules, which are the basis for design (Dickson et al., 1999). Steel-framed and horizontal slab concrete structures buildings therefore are the easiest to convert because services can be run close to their beams, while an open lay-out is kept (Gann and Barlow, 1996; Kincaid, 2002). This is making the typical offices constructed since the 1950‘s very flexible buildings. Furthermore the load-bearing brickwork (Kincaid, 2002), which was used dominantly up until the beginning of the 20th century offers a high rate off flexibility. Only buildings constructed of vertical concrete slaps pose a threat for further flexibility as they have a very rigid structure (interview Nielsen).

Aesthetics and functions are also highly linked variables (Brand, 1994). Glass curtain walls are linked in our minds to office buildings, while a brick facade is much more appealing for several functions. Luckily curtain walls are easy to replace as they are a non-bearing structure, hereby aesthetics do not immediately pose a threat to a reuse project (Brat, 2007). Looking at the wanted structure and materials it is not a surprise that old warehouses and old industrial plants, being large and made in brickwork, tend to survive longer.

To conclude this chapter on physical limitations an idea is formed of which physical limitations overweigh others. Size does not matter if lower economical profitability is taken into account. Though, some previous research has shown that some sizes of buildings are more feasible for reuse than others. This is linked with the presumption that when modules do not fit in the existing lay-out of the building, a reuse will become very costly as the basic structure has to be adapted. Services are of no importance as they are generally replaced. Here beneath one finds an overview of the physical characteristics that have an influence on the viability of a project. Next chapter investigates which actors can help or limit the adaptive reuse of buildings.

Table 3: Summary of physical restrains (Source: own)

Type of physical restrain	Improves reuse	Restrains	Importance of restrain
Size	large open spaces	small rooms < 20 sqm	From 20 sqm most uses are possible Larger open spaces enable higher flexibility
	free height 2.2, - 2,5 or more suitable for housing and offices	low ceiling	If minimum heights are not reached, low chance for conversion
Services	Reusable in new function (rare)	Too embedded to replace	Most of the time have to be replaced. Minor importance
Materials	1. Brick structures are easy to alter and aesthetic 2. Steal beams create open spaces and easy to read structures 3. Aesthetics connected to particular functions	Vertical concrete slaps offer low possibilities for adaptation.	Material connected to the ability for partitioning is important. Facade characteristics off minor importance (replaceable)
Lay-out	1.Easy to read and open structure. 2. Structures have to bare down the load as simple as possible	Supporting walls bear down in a mixed way, making the structure more complicated	The more easy the lay-out the cheaper the reuse. When modules cannot fit in, very low chance for conversion to housing or office.

5.2. From Owners till Financiers of Adaptive Reuse

Property owners do not always see the opportunities that are offered by functional reuse. In London, many property owners contributed to the problem of vacant space by being reluctant to accept that the previously higher rent values of their present function will not return. Such inertia by site owners was a significant constraint on the conversion process and temporarily masked further decreases in property values (Heath, 2001). In most of these cases, owners are often unaware of the potential to free up space and the possibility of viable conversion to a residential use (Drivers *et al*, 2003a; Oxley, 2004)). Other owners might maintain empty buildings as speculation for rising density and do not want to alter the present building, as it is waiting for destruction.

Also multiple ownership of one building can considerably stop a functional reuse as all owners have to agree if considerable works are done on the whole building (interview Ebbesen).

The users are the ones where the buildings are living for and even then, they are not independent in choosing what they want to do with it. First of all, information can be missing, secondly rental-users have to legitimate their project to their landlord, while owner-occupied users 'only' have to face the state. The ideal of a free user is not possible. State control can and has to restrict particular changes to guarantee public safety. When all these conditions are met, a user still has the challenge to leverage the funds to support the project.

It is the client that orders to do a work of art (the building) according to his wishes, but it is the **architect** that holds the pencil. The architects have to study the practicability and reachability of a reuse project. When not having the right imagination or working in the wrong paradigm, he might call the project of. Some research and interviews (interview Moltke) have proven that this is unfortunately the case:

> "The actual value systems and the underlying theoretical assumptions both of the modern movement and of the post-modern theories, offer little support. They are all basically oriented towards the design of new buildings and are not appropriate to handle the historic complexity of the built environment" (Kohler and Hassler, 2002 :234).

Educating the architects to manage reuse of buildings therefore is an important factor in improving the reuse of buildings. Architecture moreover is a fashion where architects play a role in setting the trends. PLH architects (interview Anderson) themselves chose an old warehouse as their headquarters. By this, they make a statement that adaptive reuse is feasible. Trend-setters are very important in delivering the knowledge to the main public. They can lead to the tipping point where-after reuse becomes an overall accepted procedure (Malcolm, 2002). Ottevaere (interview) beliefs that reuse out of warehouses are typically for architects and publicity offices. He does not see other companies changing to this kind of offices. Though, industrial lofts, ones the scene of artists, have reached the common image of being high-end housing and is certainly carrying a positive connotation. Even from the cradle architects can help buildings continue to survive. Even so, the next actor is much more powerful and can demise all actions undertaken by previous actors.

The Finance, Insurance an Real Estate (FIRE) industries play a major role in forming and controlling the urban landscape. They use rules that not always comply with what is best for society or their tenants. FIRE-sector, such as banks, insurance companies, pension funds and development companies, turn buildings into cash. They make the built environment take integral part of the capitalist system. With the growing strength and activity of the (international) FIRE-companies, the importance of the exchange value has risen considerably in the past decades (Kivell, 1993). A consequence of this is that buildings have to sell high and easily. As Moltke (interview) puts it: “Developers think in square meters and what they can earn with it. For investors buildings become an abstraction only visible in figures.” For the real estate sector the value of property is fundamentally tied to its highest and best use (Heslop, 2006). Therefore only when a rent or value-gap emerges between two property sectors, a conversion will happen (Barlow and Gann, 1993).

One of the other obstacles for conversions is the specialisation of the real estate market. Developers, investors and owners of office buildings have little knowledge of other branches of the real estate market as they most of the time stay in their branch (Remøy & van der Voordt, 2007). Developers and investors do expand into new markets and even switch sectors, but do it with vigilance and only when they are forced to or the costs of staying in a stagnant/declining sector or geographical market greatly outweigh the costs of the shift, including the costs of beginning at the bottom of a new learning curve (Beauregard, 2005).

If the acquisition cost together with the costs of the needed changes to bring the property to today's standards stays below the replacement cost, the project for investors is potentially viable. But that's on paper. The high rate of uncertainty can add up seriously to the final budget (interviews Ebbesen and Anderson). Therefore it is important to take a good look before you leap (Heslop, 2006).

A research of adaptive reuse showed that 41 per cent of respondents find it critical that decisions for reuse or new construction should be based on finding the option that leads to the most effective use (read: brings in the most money) of land such as increased density (Bullen, 2007): “We are not doing functional reuse out of sharity; we are doing reuse to do business (Interview Ebbensen).”

In the UK investors in adaptive reuse are typically relatively small specialist developers, or foreign financial bodies (Kincaid, 2002). Real estate companies are reluctant to use existing industrial buildings often due to a lack of rapid availability and fear of complications (building codes, risks of pollution, hidden costs, etc.) (Kohler & hassler 2002). The longer the procedures, the more profit has to be made on the building to be competitive with other investments. The fear for the hidden is nicely described in the case of the conversion of an old soya production facility in Islands Brygge in Copenhagen:

> “First of all the municipality wanted to keep the building as it had some historical value. But the value of the building, like most of the reuses, was difficult to project. In this situation (of an old soya plant) it was very deteriorated. A lot of extra costs came in. Our experience is that when we finish the adaptation and renovation of a building, the value is not as high as we first thought it would be. For us, maybe it would be the same price to start all over again (interview Ebbensen).”

In consequence, functional reuse is not systematically developed. Functional reuses are approached in a ‘project by project’ basis with experience remaining private to the individual firms involved. In these circumstances, the development of ‘best practice’ procedures is limited, with few opportunities to establish guidance for the avoidance of project failures and lower down the fear of developers (Kincaid, 2002).

Looking at the real estate’s sector way of thinking one clear lesson can be taken: the viability of converting of an existing building is connected to the profit and certainties at-

tached to such a project. As many uncertainties can be connected to it, deciding to do a functional reuse becomes a complex issue where information plays a major role.

5.3. Information as threshold

An important barrier that showed up on the radar of most actors is that there is a lack of information on the possibilities of adaptive reuse. They moreover fear the unknown aspects of a reuse project. Even before buildings can be fully (re)used, there is a problem of identification. The present lack of data on existing building stock makes an analysis for further possibilities difficult. Especially (partly) vacant buildings are difficult to identify.

Myers and Wyatt (2004) studied which information should be made accessible to make it more easy for developers to query suitable projects and heighten up the chance for buildings to be reused: the owner(s), the previous uses, the size of the vacant property, the level and accessibility of service provisions, the location, the value, the age and length of vacancy.

Most of the time this type of information is not readily available but does exist. Government systems seem to exacerbate the problem, as the information is collected in parts by their agents but at no point is it combined to create a complete picture (Kohler and Hassler, 2002; Myers and Wyatt, 2003). It is furthermore difficult to extrapolate sensible information from sparse data. For example, it might be useful to quote vacant buildings as a proportion total building stock in terms of area, value or the number of units. Hereby creating an awareness of the problem that might occur in certain areas.

A good framework of rules and information can be an invitation to be interactive. This can lead to an exchange of ideas and methods where actors can become a catalyst for innovation. The fact that the building of a house extension increases the probability of another house extension being built soon after in the immediate vicinity reflects the operation of a neighbour effect in owner-occupied houses (Whitehand, 2001). A similar effect may arise with adaptive reuse. The right information is very important to promote and seek opportunities for reuse, though interviews (MacGregor, Ebbesen)have proven that experience and networks can replace this source when absent: *“Everybody is bringing you buildings if they know you are buying something* (interview MacGregor).”

5.4. Governmental Influence

The urban fabric can be modified, streets can be broadened, new buildings can be erected, buildings can be altered, all of this is done under the watchful eye of the government. Even when adaptive reuse is not the most preferred way to be followed by the owner, the government can protect and preserve buildings (Kincaid, 2002). The government has the responsibility to find a compromise between the future and the past. As even in adaptive reuse protection can limit the future of a building. Finding this ballance was seen as one of the biggest challenges for the interviewees.

Next to protection, national and local tax policies, subsidies, standards and planning control, are important factors to plan, promote or prohibit particular changes (Bon & Hutchinson, 2000; Oxley, 2004). These policies can be area (district) and/or actor specific (Oxley, 2004; Woods, 2007). Such policies present a paradox. Laws control the basics of a construction before it even can start: Is the zoning right for the intended use? Is the structure sound and does it meet the building code? Is the building protected and if yes, to what degree?

All of these instruments are controlled via a rigid bureaucracy, which streamlines the processing of spatial policies. This system works well as long as the cases fit the regulations or standards. Adaptive reuse does not always fit the system as buildings are being used for other purposes than they were designed for. When standards and land-use are linked to one function, adaptive reuse becomes remarkably more difficult. This means that when the function of a building changes, the minimal fire escape requirements can change with them, as more people can be in the building, people may stay overnight or the accessibility of fire escape decreases with the implementation of more walls (Gann and Barlow, 1996). This kind off bureaucracy has a significant impact across all types of building prescriptions.

As standards evolve, buildings also have to adapt to new general standards mostly devised for new constructions. As rehabilitation and adaptive reuse of existing buildings has increased, some attempts have been made to devise separate code provisions for certain classes of existing buildings, enabling them to evade minimal requirements primarily aimed at new constructions.

In terms of parking, the government can advise local planning authorities to take a flexible approach to residential car parking in town centres and to specify lower parking standards for conversions of housing or other buildings, such as for former office buildings

(Department of the Environment, 1996; Department of the Environment, Transport and the Regions, 2000). A relaxation of standards in parking spaces is acceptable for functional reuse in the city centre because: firstly, the proximity of conversions to public transport and employment sources; and secondly, it is often very expensive or physically impossible to provide parking spaces as part of the conversion (Heath, 2001). Other relaxations of standards might also be possible to improve adaptive reuse, but need a thorough investigation.

In conclusion, governmental policies from all kinds of aspects can play a significant role in helping to ensure a solution for obsolete buildings and their blighting effects (Heath, 2001). Cases like adaptive reuse, that do not fit in the regular bureaucratic framework need other ways of being dealt with. More information on how these policies work and look like in practice will be explained during the discussion of the case studies of Brussels and Copenhagen.

Table 4: Conclusion on the influence of actors and state

Actor	Improves reuse	Restrains
Users - Owners	Aware of possibilities of reuse	Speculation Low Profitability No allowance from landlord, other owners No awareness
Architects	Information on possibilities of reuse available Create possibilities for future adaptations from the cradle Trendsetter for other users	No knowledge on reuse. Cannot go against the contractor
FIRE - sector	Profitability of project Low incertainties	Low profitability High incertainties
State: Spatial planning	Allow a mix of uses	Monofunctional Planning
State: Building standards	Separated standards for reused buildings. No adjustment needed to new standards	Reused Buildings have to be adjusted to meet new standards of insulation, height, fire-escape, ...
State: Protection	Low protection = higher flexibility	Few elements of a building can be altered

5.5. Locational factors

Locational factors are very influential for the possibilities of reusing a building. When developers selected the most preferred characteristic of a reusable building, they foremost look at the location (61% of all cases) and transport access (Kincaid, 2002:40). The floor plan size (54%) and the floor to ceiling height (48%) were ranked second and third.

Location is therefore at least as important as the physical characteristics of a building. An idea much shared by Macgregor (interview):

> "From our perspective it is location that is important and this drives us more than anything else. We are looking for buildable land or buildings to reuse, as we do not want to be stuck with only new building sites. A feasibility study will show what is most profitable."

Locational characteristics like access to public transport and quality of local amenities determine the saleability of a property after conversion (Kincaid, 2002). As local amenities, like public transportation and services, are best served in city centres, local reuse should score good in the city centre.

Some areas are preferred over others, and this preference is under constant change. Interesting areas of 20 years ago, might now offer a bad location as characteristics and/or preferences of the users have changed. Developers therefore always check if locational factors are appropriate enough and investigate if traffic patterns and the demographic composition of the immediate trade area can support the intended use.

Another factor that can have a negative impact is the image of the area created by a poor spatial and visual quality. Agglomeration factors, such as other similar firms moving out/in, lack of facilities and a concentration of ageing premises, are also important in creating a negative or positive image (Remøy & van der Voordt, 2007).

Without a good location that attracts other functions, a reuse will not be pulled through. Location therefore is one of the first characteristics that enables a reuse.

5.6. Conclusions on Chapter 5

The research on conditions and actors of adaptive reuse have shown that there are five main interlocking characteristics that all have their influence on the process of reuse.: (1) physical characteristics like the size of the rooms (>20 sqm), the height of the ceiling

>2,5m, the materials where it is made of (no vertical concrete slaps) and the kind of lay-out (open and easy to implement modules) can help an adaptive reuse project forwards. Above this, one cannot forget that depending on the function, buildings will need more or less characteristics. Hereby office is the most demanding function, while retail is the least demanding. Though for retail a good location is of uppermost importance.

(2) Actors in the process of adaptive reuse also play an important role. First of all the owners and users suffer from a lack on information on the possibilities of functional reuse. They are furthermore limited by the knowledge and aim of their architects, together with the occupancy structure of the building. The FIRE-sector is a profit driven sector and will not do adaptive reuse without clear profitability. It moreover is a cautious sector, for this reason (3) information on reuse and its possibilities is a major threshold for all actors.

(4) The government also plays an important role in (dis)allowing functional reuse. By having a rigid bureaucracy and not giving an exception to the existing built fabric for meeting new building standards can endanger an adaptive reuse. Spatial planning and protection furthermore play an important role in guiding the process of reuse as it are exclusionary measures that can have a positive or negative influence. When a building is protected, it furthermore stands a good chance of being reused.

(5) In the upcoming empirical analysis location cannot be forgotten, as it is foremost the location that is important for allowing a project to be successful (interview Anderson, Ebbesen, Macgregor). During further analysis it is clear that physical characteristics, profitability, information on the building stock, location and governmental influence and control have to be taken into account.

6. Reuse in Brussels and Copenhagen: the case studies

6.1. The legal framework for Adaptive Reuse

The theoretical capacity of adaptive reuse depends largely on how the spatial planning policies are restricting and directing reconversion. This chapter examines the particular and common spatial policies for adaptive reuse in Brussels and Copenhagen.

6.1.1. Spatial planning control for Brussels and Copenhagen

Land use planning as one knows it today, is only a recent phenomenon. Up until the mid of the 1990's, when the regions in Belgium implemented their own land-use plans, spatial planning was highly influenced by private actors, where large scale projects altered the landscape of Brussels (Dessouroux, 2010). Cataclysmic capital destroyed old mansions, pushed out the residents and made a mono-functional central business district stretching from Brussels' northern district over the eastern part of the central city (the pentagon) to the European/Leopold district. On this axis large office buildings of more than 10.000 sqm dominate the urban landscape. The centre of Copenhagen did not undergo this much ruination, although there were similar plans for tearing down neighbourhoods to make way for highways and modern buildings (Reeh, 2002). Here public opinion was more successful in agitating against these measures.

The organisation of spatial planning in both cities differs significantly. The Capital region of Brussels has full control over its strategic and land-use plans, hereby they only have two levels of control: the regional and the municipal level. Though the policies of spatial planning are more dispersed as one would think first: there are three ministers dealing with aspects of conversion (minister of Spatial Planning, secretary of state in Urbanism and a minister of Housing) and at least 19 more aldermen are dealing with spatial planning. This is certainly affecting the possibility to create common reuse policies.

Copenhagen also is responsible for spatial planning, but has two entities above it that control spatial planning: the region and the national level. On the other side, only one minister is responsible for spatial policies, which enables the creation of policies specifically aimed at adaptive reuse(interview Probst and Brüell).

As the hinterland of Brussels also has independent spatial planning policies, there is a fierce competition in spatial planning. Brussels, Wallonia and Flanders all try to attract companies and inhabitants. Especially in the office sector, Flanders (Diegem, around the

airport) and North of Walloon Brabant (Waterloo) are offering cheap locations where Brussels cannot compete on the price. Furthermore large companies can challenge all three regions to press through projects. A similar competition is recently visible since the opening of the Øresund (toll)bridge, which connects Copenhagen with Malmö. Copenhagen, on the other side is still more a primate city with less direct competition as it has more control over its surroundings. It has the opportunity to dominate the planning decisions over its surroundings (except for Malmö) thanks to the regional and national spatial planning levels, where Copenhagen has an important saying.

To synthesise: Brussels and Copenhagen draw on a contrasting planning history and furthermore have a different planning control that will influence further analysis of functional reuse.

6.1.2. Rules for Construction Enabling or Disabling Reuse

Does a change of function need a building permit? is a crucial question when it comes to facing bureaucracy or not. In Brussels a building permit has to be issued for all changes of uses that are seen as significant. Conversions between office, workshops, retail and housing are seen as significant (tel interview). Copenhagen has a less time consuming approach depending on the size of the project: spatial planners only require a building notice[1] for conversions of areas not larger than 150 sqm[2]. These changes should not entail a significant change of use defined as: *“a use for another purpose that involves significantly higher energy consumption. Conversion of an attic or stock area to housing therefore is a significant change of use (7.3.1(1))- Danish Building regulations)”*. All other conversion not dealing with these preconditions need a building permit. Copenhagen hereby has an advantage over Brussels as small offices can be converted to housing without going through the whole procedure of building permits.

Bringing buildings up to modern standards is seen as the biggest challenge for during the process of reuse (interviews Moltke, Andersen, Ebbensen). Buildings that are undergoing a refurbishment furthermore have to be in accordance with the building prescriptions fitting their new function. Copenhagen makes no differentiation by function or by kind of

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[1] = registration at the BBR (Bygnings- og Boligregistret - the Building and Housing Register of Denmark)

[2] This exception may only entail a conversion within one business or residential unit. Escaping a building permit by multiple registration of units in one building is not possible.

construction (new built or refurbishment): all buildings heated up to 15°C and over have to comply to the same standards. Brussels on the other side did create a distinction; depending on the scale of the refurbishment and the type of the building, other energy standards are applied (Gewestelijke Stedenbouwkundige Verordeningen, 2006). Hereby housing has the highest standards. When an office in Brussels is being converted into housing, it has to meet higher standards than during an ordinary refurbishment, hereby creating an extra threshold that is not present in Copenhagen.

When new standards cannot be met because of problems inherent to the structure, Copenhagen has the possibility to fight the new standards. A municipal council then has to decide if a exemption can be made. Next to the challenge of meeting new energy standards, conforming with housing/workplace requirements is seen as a substantial hurdle to be taken (interviews Ebbensen, MacGregor). Brussels and Copenhagen both have minimal requirements for heights and sizes of rooms. Recent years standards have gone up. Surfaces during conversion might not meet minimal requirements, hereby extra walls have to be cut down. This can create oversized rooms, which cannot be capitalised as apartments are mostly sold according to the amount of rooms they have (Brat, 2007). If this is the case in Brussels, one can fight these minimal room standards via a commission (Bewoonbaarheidsnormen voor woningen, 2006).

Except for buildings worthy of preservation, no other exceptions were found for reusing a building. Protected buildings' refurbishment and changes of uses have to be negotiated with a particular department that determines what is possible.

With the aim of preserving a listed building in Brussels, a conversion to housing, production-facilities, retail, offices or hotels is possible if it also is in accordance with the Royal commission for Monuments and Landscapes. In Denmark the possibilities are negotiated between the Heritage Agency of Denmark and the Spatial Planning authorities, where the Heritage Agency of Denmark has the final saying (Interview Probst & Bruël). This means that functional reuse of protected buildings is not decided by the spatial planning departments, but by their respective heritage agencies. Interview showed that this is creating an extra threshold as spatial planning still has to give it's approval on the decision of the heritage agencies:

> "The more departments you have to negotiate with the more difficult it becomes, as not all have the same requests and sometimes give contradictory advises (interview MacGregor)."

To sum up the trends for the rules enabling or disabling conversions, one sees that several exemptions can be made for conversion projects, making it more easy to bend the existing framework to present day needs. The downside of this is that one has to convince the Department of Urbanism or face politics to get the exemptions, which is not always the case as one of the interviews proved.

6.1.3. Taxes and subsidies for promoting reuse

Governments also have other instruments to influence the spatial structures of cities. As the municipality of Brussels has a long-time problem with vacant buildings, they implemented a tax on vacant property to stop dilapidation of the built fabric. Owners in this way are forced to rethink the way their property is managed and so might open up the opportunity for starting a reuse. Buildings and plots that are neglected or unused, like empty floors above retail, all of them are taxed by this system. Though, it would not be Brussels if 67% of the cases that had to pay this tax objected to pay it.

Brussels not only uses the stick to support the renovation of buildings, they also use the carrot: via regional subsidies houses can be renovated, even when a building comes from another use and is not in conflict with the land-use plan. If the building is older than 30 years, the owner has right on a subsidy of up to 35.000 € for a dwelling with 2 bedrooms.[3] Hereby, if this subsidy is well known at the public, Brussels can help the conversion to housing considerably. It becomes even more interesting as a large warehouse can be bought in group and subsidies are given per housing unit. Percentages refunded depend on income and owner structure [4] after construction(www.renovatiepremies.be). Brussels furthermore has zones of neighbourhood contract and zones to promote housing (stated as RVOHR on figure 1) where extra subsidies (percent wise) are given and less requirements are asked. The historical city centre of Brussels can certainly profit of these subsidies as large areas are coloured by one of both kind of promotion zones (see figure

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[3] This maximum subsidy is raised with 5.000 € per bedroom starting from the third bedroom.

[4] Only when the owner is going to be domiciled on the location for minimal 5 years, he will be eligible for funding. Also companies can ask for subsidies, but then they are obliged to rent the apartments to social housing offices of Brussel for at least 9 years. Social renting is also possible when you are a natural person that does not want to live there, but do want to do a refurbishment (for example a space above a shop).

1). Copenhagen only has subsidies to renovate housing that already are housing, hereby missing the opportunity to support conversion to housing.

Figure 1: Pentagon of Brussels with brown as region to promote housing function, blue is zone with neighbourhood contract. (www.prime-renovation.irisnet.be/)

Another advantage of Brussels is that it offers a lower VAT (Value Added Tax) off only 6% for refurbishment[5] against 21% VAT[6] for new constructions. This reduction of 15% in costs can make a huge difference for large projects. In interviews this was mentioned as the largest advantage of an adaptive reuse project over a new construction. In Copenhagen no difference is made between different kinds of constructions. VAT for conversions therefore is 25%, making it 18% more expensive than in Belgium to do reuse.

Next to VAT also registration costs are seen as a threshold for changing ownership. Here Brussels scores the worst as it has one of the highest registration costs for property in Europe, reaching 12,5%. Though, this level can be lowered down when the owner is going to live in the property, it is still much higher than in Copenhagen where registration cost are 309,89 EURO (2306 DKK) + 0.6% - 1.5% of transaction fee.

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[5] This measure is coming to an end this year, but might be extended.

[6] Temporarily during crisis time this VAT level has been lowered down to 6% for new constructions for the first 50.000 Euro's

A last remarkable policy measure for promoting conversion came from the secretary of state for Urbanism who is funding the Bruocsella price. The aim of this price is to hand in a renovation project for a non listed-buildings that will improve the quality of life in a neighbourhood. They explicitly mention that conversion projects take part in the Bruocsella Price. The winning project gets 25.000 euro.

To conclude the subsidies for and taxes on reuse one sees that Brussels has much more subsidies to support reuse. The VAT tax advantage for refurbishment is really creating opportunities for reuse to be chosen above a new construction. Transaction cost on the other side slow down turnover time for buildings in Brussels, as buying and selling buildings is much more expensive than in Copenhagen. Hereby both have their advantages and downsides, with Brussels is creating the most opportunities specifically for reuse.

6.1.4. Procedure time - the project killer

If a change of use is in accordance with the land-use plan and building prescription, a building permit can be issued. The period wherein a project can be managed can mean the death or life off an adaptive reuse project as developers want see let their capital circulate (Brat, 2007). Above this chapter 5 has shown that sometimes only a limited window of opportunity enables projects. Interviews in both cities indicated that there is no difference between the term necessary for a building permit of a new construction or an adaptive reuse when land-use allowed a change of use[7]. When land-use plans do not fit the aimed use, terms of one year or more are typical to change the land-use to the appropriate use. Though, a success in changing a function is not always guaranteed. Changes in land-use plans have to undergo a public inquiry and face politics. In Brussels these take up at least a 120 days. Non compliance of land-use plans therefore can considerable extent the time a project takes.

Before moving to the land use plans, Table 5 will give an overview of the spatial planning policies excluding the land-use plans.

[7] Copenhagen +- 0,5 year and Brussels 75 - 120 days

Table 5: Conclusion of Spatial Planning control in Brussels and Copenhagen

	Brussels	Copenhagen	Most advantaged city for conversions
Historical Context of reuse	Mixed downtown with high rise sky-scrapers of more than 10.000 sqm and historical buildings.	Mixed downtown of offices and housing, well preserved and no sky-scrapers in the historical districts	Copenhagen (see 6.2 and 6.3 why).
Control over Spatial planning	Full control for the region, but politically dispersed	High control, more concentrated into one ministry	Copenhagen can be most decisive
Competition with surrounding regions	High competition = dispersed investments all over the functional urban region	More control over hinterland = possibility for concentrated development	Copenhagen
Building Permit needed for Functional reuse	Always	Not <150 sqm*	Smaller conversions in Copenhagen
Energy standards	Several standards	One standard for heated buildings (> 15 °C)	Copenhagen
Exceptions for conversion	For size of rooms/layout: yes For energy standards: not found	Exceptions are possible under negotiation and approval of a special commission	Copenhagen
Protection	For protected buildings a national heritage board decides which functions are possible.		
Subsidies for conversions	yes	no	Brussels
VAT for conversion	6%	25%	Brussels
Registration costs	12,5%	309,89€ + 0.6% - 1.5%	Copenhagen
Building permit time	75 days	+- 6 months	Brussels
Altering Land-use plans	120 days (minimal)	+- 1 year (average)	Brussels

* Only when there is no significant change in energy use

6.1.5. Strategic and Land-use Plans

The Awareness and Possibilities for Reuse

Land-use and strategic plans are crucial in allowing a building to be altered. First of all land-use plans are made to exclude certain uses. This means they are elaborated with predefined aims. In Brussels these aims, 'the 12 priorities of Brussels', are structured in the Regional Development Plan (www.gewop.irisnet.be/), while Copenhagen both strategic and land-use plans are mentioned in the 4-year municipal plans[8] (Københavns kommune-plan, 2009). Both strategic plans have several parallels: they see the supply of qualitative housing as a first priority. This is not a surprise, as the enforcement of housing has to be seen in the light of the search for a taxable base to support the city. Better qualitative housing enforces the attractiveness of living in the city. The first strategic priority of Brussels specifically mentions the option of giving new destinations to empty buildings (section 1.2.1). To support this, an inventory off all vacant buildings and several subsidies are elaborated. The new municipal plan of Copenhagen is also aware of the options of adaptive reuse in supplying the needs of particular functions: it foresees the growth in youth or college housing via the conversion of offices (together with new construction).

Also the alteration of destination of certain districts is managed in strategic plans. Copenhagen already has drawn up several zones in the municipal plan where major destination alterations may take place. These areas are mainly areas with exclusionary zoning with only one function, consisting of old industrial or harbour areas like the Carlsberg brewery site, the Northern harbour. These sites first have to be abandoned by its original uses before new functions like housing, offices and retail can be allowed via a land-use plan. The crisis has postponed the start of developing these areas as otherwise it will be a competition for development in other areas of the city where already development has started. These large scale alterations plans indicate that the government wants to control change of uses to a large extent. Though, as will come out in the next part about the land-

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[8] While the Danish framework of municipal plans, consists of guidelines for housing density or building density, maximum height (defined as combined number of floors in residential areas (B) and services-(C) areas), the useable area, size and parking coverage, in Brussels the structural building limitations are governed via the regional building prescriptions where also the insulation standards, accessibility and all other building standards governed by the region are controlled. Land-use plans in Brussels only govern exceptions in prescription.

use kinds, the city centre allows spontaneous changes to happen without the need for local plans.

Similar to Copenhagen, Brussels has strategic areas open for conversion: the areas of regional importance. Their future uses are drawn up in special regional land-use plans. These areas are characterised by their special aims and allowances for the construction of office space. These areas can only be used when no other solution within the Brussels capital region can be found for a company[9].

A last mentioning in the Brussels strategic plan about the conversion of buildings is in the forth priority, which is built around the need for redevelopment of the central urban areas. To support this, particular zones, like the Western part of the city centre of Brussels is marked as an area to enforce the development and renovation of housing. As seen during point 6.1.3 these areas receive extra subsidies, which can also be used for conversions to housing.

Also the coalition agreement of the new government of Brussels 2009 mentions the need for conversion of old offices to housing. An interview with the ministry of housing and urbanism showed that the politics are highly supportive to this kind of projects, but does not mention how they will elaborate policies for it.

As seen in chapter 5 extra flexibility is necessary to deal with certain reuse projects. In Copenhagen and Brussels special local plans can be used for these occasions, which further specify superior plans. In Brussels exceptions to superior plans are possible via a negotiation commission, together with a public inquiry and advise of the Regional Government of Brussels. In Copenhagen local plans have to be drawn for every major construction or demolition that drastically alters the environment[10] and/or are dealing with a sensitive environment. Hereby the local plans of Copenhagen and the special destination plans of Brussels have special powers that can enable reuse projects previously impossible. Spatial planners of Copenhagen explained that they use local plans to alter function of an area faster than the 4 years time laps wherein a municipal plan is renewed, though it takes a lot more time than a normal building permit. An interview about the special Destination

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[9] Other areas of regional importance like the North neighbourhood, the neighbourhood around the south station and the administrative Leopold district first have to realise at least 530.000 sqm of new office space before construction can start in the postponed areas.

[10]For Copenhagen this means the creation of larger parcels and major civil engineering works, which means every project of more than 2000 sqm or 40 dwellings. Plans for other plans are also possible

Plans and Local Plans made clear that if politicians can be influenced to do a change, a lot can happen. But what is possible via the ordinary land-use plans? Following chapter will discuss how the 8 land-use kinds of Copenhagen and the 20 land-use kinds of Brussels are influencing the capacity to do a reuse. In table 6 a comparison is made, putting similar land-use kinds next to each other. On first sight the land-use classes look pretty similar, but their flexibility differs highly.

Table 6: Links between the kind of Landuses in Brussels and Copenhagen (own)

Kind of land-uses in Copenhagen	Kind of land uses Brussels
Residential areas (B)	Areas with Residential character - Typical residential areas
Areas for housing and services (C)	(Strongly) Mixed-use areas
Areas for services (S)	Areas for administration
Fields of industry (J) Areas of technical equipment (T) Areas of mixed occupations (E) Areas for port uses (H)	Areas of Urban industry Area for port and logistics
Areas for public institutions and recreational areas (0)	Green areas (8 different classes)- but no public institutions Areas collective importance or public services
	Areas of regional importance Areas of regional importance with delayed construction Reserve areas Railway areas

Before starting the land-use kinds, it is important to mention that both land-use plans have delimited the historical city as preservation area, hereby the majority of the inner City of Copenhagen (Indre By) and some areas in Christianshavn are exempted from some standardised guidelines like the building density and functional mix. In Brussels this preservation area is only protecting the existing state of the environment by maintaining the building profiles or the view of the facades which are visible to the public. Buildings there-

fore cannot be easily destroyed and have a higher chance of being reused. Though a higher flexibility on the uses like in Copenhagen is not mentioned.

The spatial planners of Copenhagen explicitly say that the inner city needs these exceptions for conservation reasons, otherwise half of the inner city would not comply the standards for densities and functional mixes. In Brussels the density is not defined on a general basis, but is place specific and depends on the height and depth of the surrounding buildings, which it may not surpass by a certain amount. Buildings that tower over the surrounding buildings should normally be lowered down when a destruction and new construction is done. As this is a loss in economical surface, landlords will chose to preserve the present building, improving the chances for being functionally reused.

6.1.5.1. Possibilities created by Land-Use Plans - Retail

Retail is the most flexible function as it has the lowest requirements and is most of the time mixed with other functions like office or housing. Because this mixed character, retail cannot be put in an independent land-use colouring. In Brussels every land-use kind has special regulations for retail, while Copenhagen is managing its retail via an initial framework.

Copenhagen is highly controlling and limiting the possibilities for retailing via the municipality plan. Planning law provisions control which kind of shops are possible, the surfaces they can have and on which particular locations they can be placed. According to the municipal plan, retail shops should be located in the defined shopping areas of Copenhagen's districts. In these districts the retail function is protected from reuse to other functions other than retail and public-oriented functions. Brussels also has predefined shopping areas where the function of shops has priority, but is less restrictive outside these shopping areas when it comes to allowed surfaces and kind of shops. Where in Copenhagen non-grocery shops are not allowed to grow larger than 100 sqm outside a designated shopping area [11], Brussels already has 150 sqm at the most restrictive land-use kind[12].

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[11] Small community food shops outside the designated central shopping areas cannot exceed 500 sqm, even 200 sqm for residential areas.

[12] Area of residential character.

Furthermore Brussels allows shops to make extensions[13] on the site if a public inquiry is done and following rules are followed:

1. that the enlargement is underwritten with social and economical motives.
2. that the local situation allow an enlargement and does not suppress the major function of the area
3. that the measures and works were done under special rules of publication[14].

Designated shopping areas in Brussels and Copenhagen[15] are mostly the historical city centres and it's transportation access leading out of the city (see figure 2). These shopping streets grew organically via conversion of ground-flours and creation of new buildings, because it are highly visible and busy locations (interview Moltke). This trend is still continuing. These shopping area's are now embedded in spatial planning and is a nice example of how spatial planning reacts on spontaneous and older trends. The high protection of Copenhagen's retail has to be seen in the light to promote certain shopping area's and stop the sprouting up of shops in unwanted location, thus crippling the possibilities for new shopping areas to start. Spatial planners do want to give opportunities to good initiatives, but then a local plan has to be made to allow larger shops outside the predesignated areas (interview Bruël and Probst), hereby slowing down a project by almost one year. A positive point for the urban flexibility of Copenhagen is that the city centre of Copenhagen is almost fully recognised as a shopping area and is allowing a lot of shops to start up and extent: Copenhagen's municipal plan (strategic plan) foresees a rise of 40,000 m² in retail for the centre in the coming 4 years. As a large part of the inner city is historically protected, functional reuse can play a major role in meeting this rise.

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[13] In Brussels, the maximum surface is restricted to 200 sqm for retail and 500 sqm for wholesale in Mixed-use areas, but is quite flexible in allowing extensions to 1.000 and 1.500 sqm.

[14] Special rules of publication consists of a public inquiry and a commission. The public inquiry serves to inform the population and ask for there comments. After a public inquiry, the commission debates the project and brings out an advise, based on the comments of the surrounding inhabitants on the project. The municipality can then follow the advise or motivate the deviation when a building permit is issued or not.

[15] Examples are Østerbrogade for Østerbro, Norebrogade for Norebro, Vesterbrogade for Vesterbro and Amagerbro for Amagerbrogade.

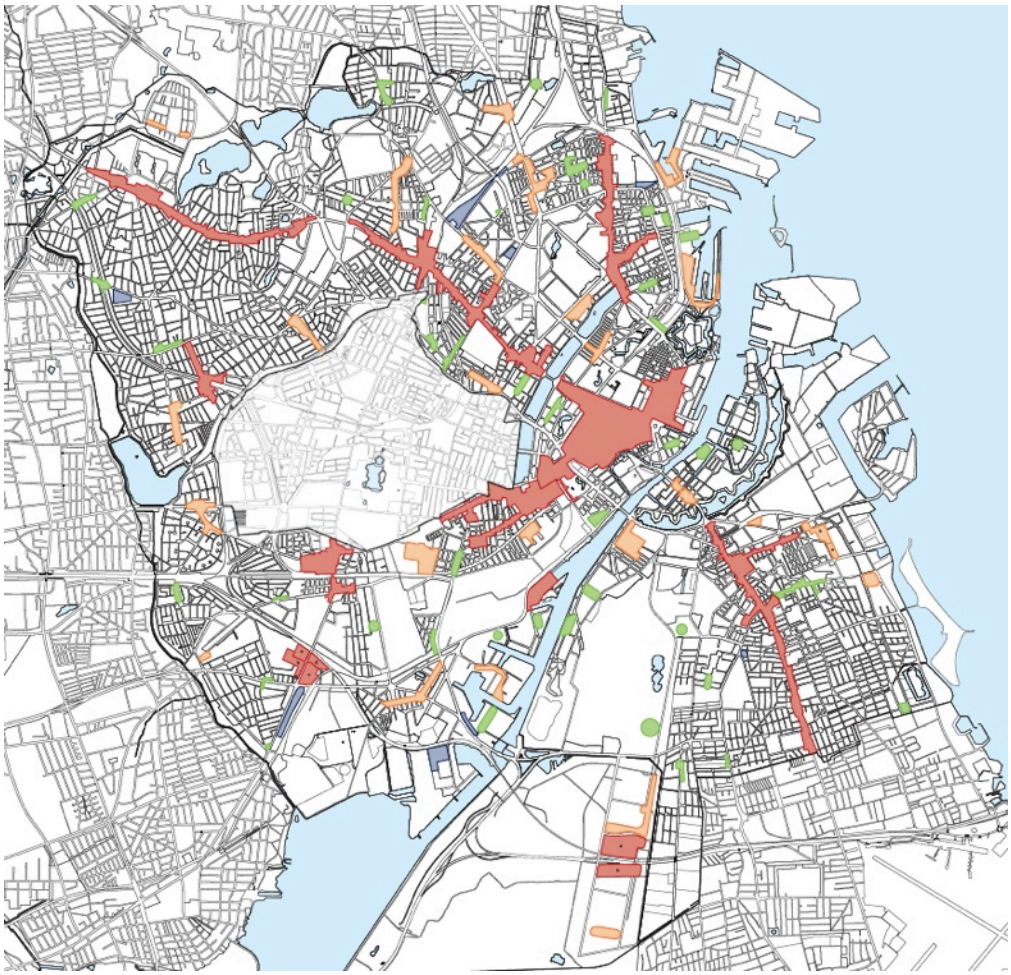

Figure 2: Protected Shopping districts in Copenhagen (Red: city centers, orange: neighbourhood centers, green: local centers)

6.1.5.2. Possibilities created by Land-use Plans - Housing

Housing is the most flexible function to change to in both Copenhagen and Brussels. It is well protected from conversion in the typical residential land-use types, while in other land-use kinds it can still take up a considerable amount. In Brussels there neither is a maximum allowed housing in mix-use land-use nor in the services land-use. This means that housing theoretically can take over these zones.

In Copenhagen on the other side one sees that housing only can take up to 75% [16] in the mix-use land-use kind (C). Also the land-use for Services (S) in Copenhagen has a restriction for housing. Normally 15% of the floor area can be used for housing, though central Copenhagen and Christianshavn have an exception and housing may rise up to 50%.

The reason why Brussels is much more flexible with housing in a service area is because the land-use plan is made during a time that housing was a very weak function compared to office activities. A protection of offices activities to a certain extent was therefore not thought necessary. In Copenhagen on the other side, housing is reaching prices similar to offices. To guarantee that both functions remain in the city, they are protected in at least one land-use kind.

To further protect the housing and its residents from being pushed out by market forces in Brussels, a total or partial conversion of dwellings, or even the destruction of a dwelling, is only allowed when compensatory measures[17] are taken or one of the predefined conditions is met[18]. Above this housing land-uses have a basic requirement that at least one dwelling has to be maintained in every building. Also Copenhagen is asking compensation for the loss of housing functions during conversions, but no legal framework to support it was found. A strict protection of housing is less necessary as it is more equal in economical terms in Copenhagen (see actual reuse).

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[16] Normally this is 50%, but local plans can adjust between 40 and 75%, like is done in the historical city centre.

[17] On the same plot or in the same area, a housing function with at least the same surface has to be added to maintain the housing function in the area.

[18] (1) If the space is intended for offices of independent professions and this only up until 45% of a house and 15% of an apartment building. (2) Also when it is altered to house public services or is substituted for green areas, a conversion is allowed without compensation. (3) When it allows the reconversion of a listed building. (4) The extension or founding of retail, when the building is placed within a shopping street. (5) Furthermore a production facility can replace housing, but only when it is for an extension.

Some zoning will always be necessary to exclude from housing as certain activities are noisy, polluting or need large surfaces. These areas are delimited in both cases as areas used for (light) industry, workshop, craft, stock, wholesale, transport and warehousing (In Copenhagen defined as JTEH land-uses see Table 6, or in Brussels as industrial, harbour and logistics). In these land-uses only industry together with other companies that are naturally seen in the area are possible.

6.1.5.3. Possibilities created by Land-use Plans - Offices

As already mentioned before, Brussels has a history of primacy of office space over all other functions. They therefore introduced the map of the remaining office area to control the further development of offices. This map mentions how much more floor area for offices can be added according to its place in the gridwork[19] (see figure 3). This maximum are only for mixed areas and areas for housing, where offices are furthermore limited to a certain surface.

The aim of this plan is to have spatially dispersed offices and allow housing to be developed in these areas. The floor areas for offices in Mixed-use land-use may not surpass 1000 sqm per building in Brussels, with a functional maximum of 500 sqm for offices and production facilities. In Copenhagen this mix-use is translated into maximum 60%, but the municipality plan advises housing to be more important than services.

Housing land-uses are very restrictive for mixing with other functions; in Copenhagen only 100 sqm per building can be used for services[20] in the in the lowest density zones, while in Brussels both housing land-use kinds already allow 250 sqm of offices per building. Offices therefore are much more limited in their possibilities than housing, though in Brussels it still has a large zone in the middle and east of the city centre where office

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[19] Each grid consist of a group of plots and has a maximum allowed new office area. It is important to mention that smaller offices (<75) and offices between 75 and 200 sqm that do not take up more than 45% of the total area of an existing house, are not taken into account to calculate the remaining possible office space.
Offices between 75 and 200 sqm have the further condition that they have to be the main residence of the person who practises the activities or is a one of the main stakeholders of the company. Also offices in apartment buildings for independent professions (i.e. independent doctor or lawyer) are not taken into account if they do not take up more than 15% of the floor area of the building.

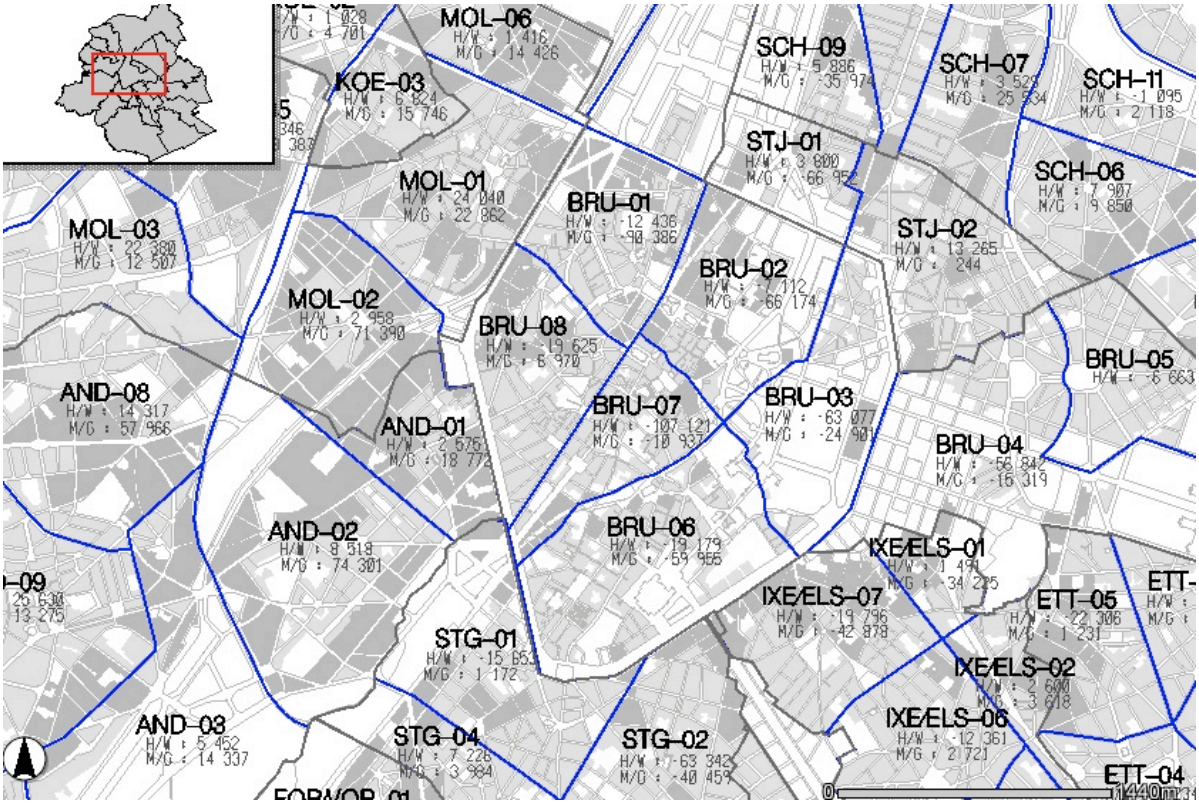
[20] Defined as shops, liberal professions like doctors, professional and leisure education, workshops (handwork)

space has a free game to develop (see figure 5 for Administration land-use). Also the services land-use in Copenhagen is primarily aimed at offices, but housing can maximally develop up till 15% or 50% when mentioned in a local or municipal plan.

It is important to mention that the land-use plan in Brussels already foresees the extension of companies beyond their initial surface, though this is only possible under the conditions of a public inquiry.

Figure 3: The gridwork for allowed offices in Brussels

(Source: http://geowebas1.ci.irisnet.be/PRASCASBANL/viewer.htm)



H/W Allowed offices in Housing areas

M/G Allowed offices in Mixed area

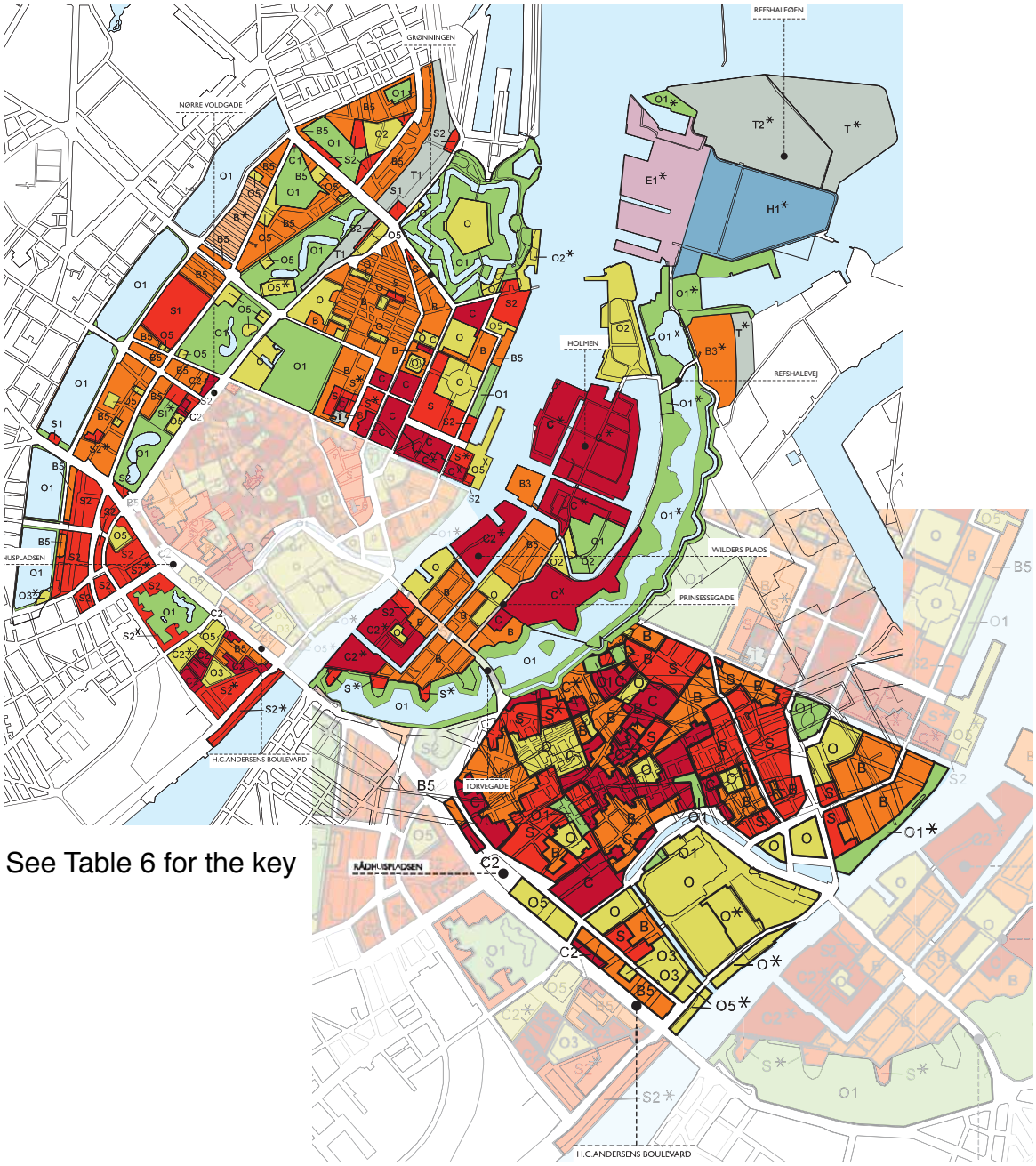
6.1.5.4. Possibilities created by Land-use Plans - Industry

In Copenhagen warehouse and workshop activity can hardly be mixed with other functions, especially housing function excludes a mix, while in Brussels a mix is possible. This allowed mix can be explained by the historically grown situation in the canal zone where housing and warehouses have coexisted since long. Warehouses and workshops are even allowed under certain environmental conditions to make extensions in housing,

mixed use and administration area. As there is no minimum amount of industry in these areas, industry can easily disappear in these areas. Industry is mostly mixed with housing and offices in the east of the pentagon around the office zone. Only a small zone is protected by it's own exlcusionary land-use kind. In Copenhagen warehouse activity is mainly located in it's own land-use, where only offices and dwellings (owner) connected to the industries can be located.

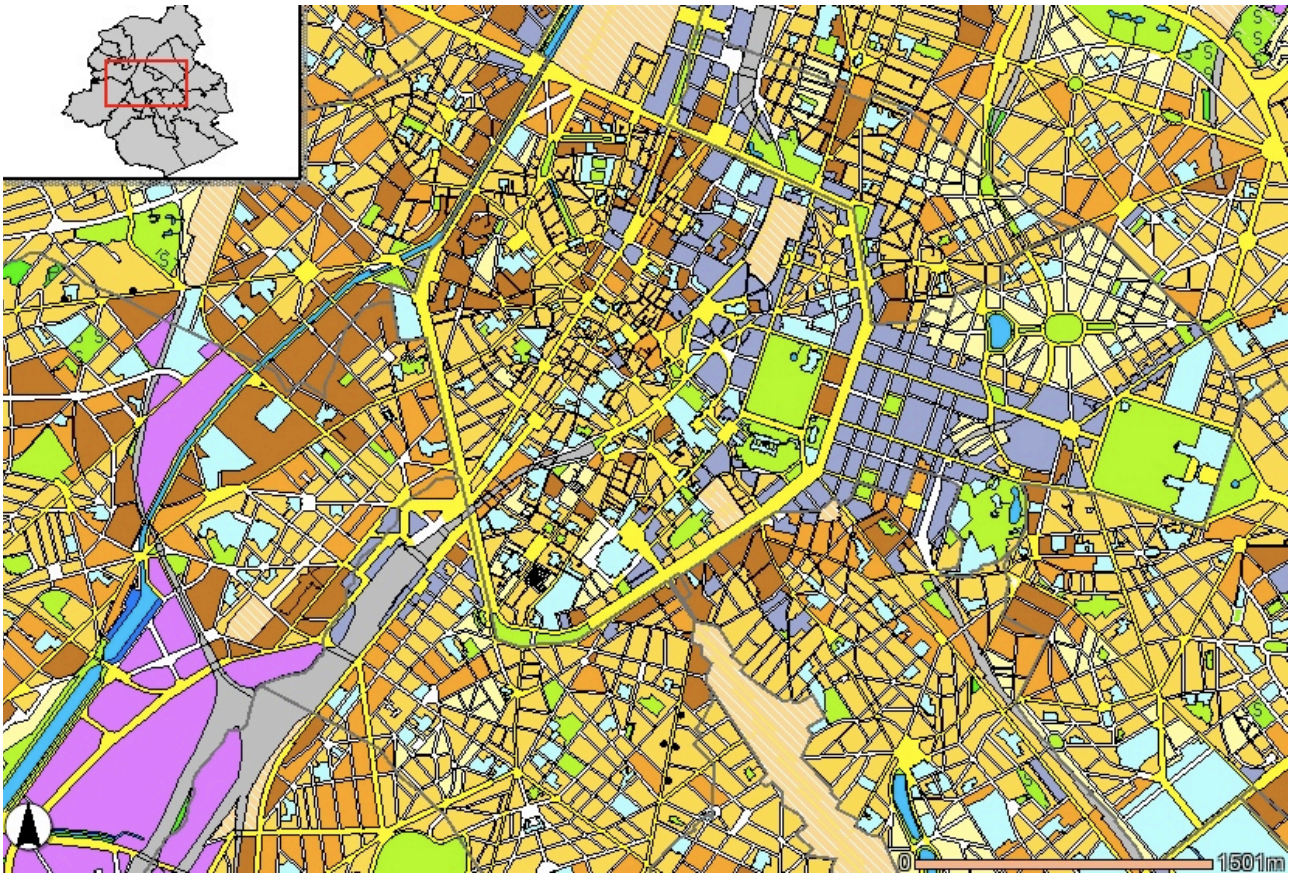
Figure 4-L: Land use in the first district of Copenhagen

Figure 4-R: Land use in the historical core of the first district of Copenhagen



See Table 6 for the key

Figure 5: Land-use in Brussels historical district



http://geowebas1.ci.irisnet.be/PRASAFFECTATIONNL/viewer.htm

- Living areas with residential character
- Typical residential area
- Mixed Areas
- Strongly mixed Areas
- Administration Area
- Areas for public services
- Urban Industry
- Areas of regional importance

6.1.5.5. Conclusions on Land-use and strategic Plans

Strategic plans definitely show their use for allowing governments to make decisions without being attached to a predefined framework. It reveals the path that can be walked and the zones that should be developed. Strategic plans in Brussels and Copenhagen have special attention for zones that have to be converted. As the future is uncertain, the uses are not yet defined for these zones. A first call for flexibility in land-use is hereby given. Major zones of conversions might have elaborated agendas, the smaller individual conversions are only briefly touched. In Copenhagen, except for one small sentence on student housing, only major conversion projects are mentioned. Brussels does have more awareness of smaller conversions in the city centre as they are following up vacancy for this purpose and have zones to promote housing. Although this looks a lot, interviews[21] have shown that ministries only know few about this topic and do not (yet) have specific policies only linked to conversion. City governments are therefore not aware of it's full capacity.

Analysing both cities' land-uses has proven that both Brussels and Copenhagen have considerable zones that allow functional switches. First of all retail is such a mixed function that it does not have it's proper land-use and is allowed in all land-use kinds. This makes retail a highly flexible function.

Looking at the combinations possible, housing is the most flexible function in both cities. First of all, conversion from housing to other functions is limited and only possible under certain conditions. Secondly only the industrial land-use is seriously limiting conversion to housing. Thirdly, the housing land-use kind only allows a minimal mix with other functions. Office might be the biggest victim as they have the highest flexibility to start adaptive reuse from and this for the historical districts of both cities. Hereby especially conversions between housing and offices will be possible via the existent land-use plans.

In general, except one, Brussels has the most flexible land-use plan for the city centre as it allows the highest functional switches in all kinds of land-uses. Brussels moreover offers a lot of extra flexibility for other conversions via the possibility of extensions without the need for creating an extra special land-use plan.

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[21] I have made several attempts to contact that different ministries to talk about this subject, but none knew the right person to talk about it.

Table 7: Land-uses and their possibilities

Land-use	Brussels	Copenhagen	Highest flexibility
Retail	No specific land-use kind because of flexibility		Brussels allows retail to sprout up more spontaneously.
	Outside shopping zones shops can grow and enlarge considerably	Localisation of retail highly governed by state	
Housing	Mix with small offices and workshops	Mix with small offices	Larger surfaces of other functions can be combined in Brussels
Mixed	Mainly housing and offices till 1000 sqm. All functions except housing may rise till 1500 per building	Dominated by housing (40-75%) and a high mix of offices	Copenhagen
Offices	Office zone with no maximum for housing	Office zone with a max of 50 % off allowed housing	Brussels
Industry - harbour	exclusionary, only a house for the proprietary		/
Public services	Inflexible land-use kind. Only conversions between services of common good are possible.		High presence in the centre of Copenhagen. In Brussels public functions are more mixed with other land-uses

6.2. Actual reuse in Brussels and Copenhagen

6.2.1. Overall conversions

Building information is crucial in knowing where the present reuse is happening, though the follow up of conversions in the city is not a natural process. Without knowledge on the dynamics of reuse, no policies to support (un)wanted changes caused by reuse can be elaborated. Brussels only has sustained data on conversions from and to offices. The 'Review of Office Property' (Coekelberghs & De Beule, 2009) studies all the building permits that consider offices. Furthermore a smaller study on the reuse of workshops and warehouses is done by the Regional Development Authority of Brussels (GOMB - SDRB). This study is also based on the building permits issued for workshops and warehouses during a 22 months period.

For Copenhagen, no reliable figures on conversion of buildings could be found. They have statistics on conversions, but the Bank of Statistics did not register any conversions between 1986-1995. This is highly unlikely, as functions in Copenhagen changed considerably (see Table 8): an area comparable to at least 13 % (e/d) of the city underwent an adaptive reuse or has been demolished in the past 23 years. Office, housing and welfare institution had the highest rise (column b) in surface. Factories and other buildings used for production lost 40% their original surface. Hereby one can say that Copenhagen became a totally different city in only 23 years.

Reuse in the historical city centre of Copenhagen furthermore cannot be calculated directly. Via an analysis of the whole municipality of Copenhagen, trends for the historical city centre will be deciphered via interviews and statistics on the district level.

The irony of this lack of information is that both for Copenhagen and Brussels reuse could be easily registered with a minimal extra effort: during a building permit[22]or registration of change all data of the previous use and the new use are already given to their respective bureaux of statistics. The problem is that in Brussels the office of statistics only registers the new use, while in Copenhagen they simply register and unregister uses without keeping track of the changes. Therefore all data used on adaptive reuse comes from own calculations (all for Copenhagen) or from studies based on building permits.

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[22] This request for mentioning the previous use only happens for building permits of housing in Brussels. No previous use is asked for building permits from other uses

Table 8: Possible conversion and functional changes in Copenhagen (Own calculations; Statisti Banken Denmark)

	Absolute surfaces in 1000 sqm			New Constructions *	Demolition or Adaptive Reuse
Function	**1986 (a)**	**2009 (b)**	**Change (b-a)**	**From 1986 till 2009 (c)**	**(b-a)-c**
Residential buildings	21593	24209	2616	2.544	72
Office, trade, inventory, incl. public administration	6029	7718	1689	2.141	-452
Public institutions**	2770	3454	684	589	95
Recreation facilities	381	503	122	148	-26
Hotel, restaurant, hair dresser and other services	640	757	117	154	-37
Power stations, gaswork, etc.	282	283	1	56	-55
Residential buildings for communities	331	329	-2	29	-31
Non-residential farm buildings	55	26	-29	1	-30
Student hostels	346	293	-53	65	-118
Transportation, garage or other unspecified transport and trade	520	404	-116	105	-221
Factories, workshops, and other buildings used for production	2618	1564	-1054	249	-1.303
Total	35565 (d)	39540	3975	6.083	-2.108
Sum of Absolute values			6949		4548 (e)

* inclusive extensions

**Institutions for pre-school children, Sports hall, Hospitals, Education facilities, Cultural purposes, Townhouses and the like

A first indication for adaptive reuse can be calculated by lowering down the change of the absolute surfaces with the amount of new constructions during this period (see Table 8). A positive figure means that not enough new constructions were built to explain the rise in surface. In consequence, part of the rise is linked with adaptive reuse to this function. A negative figure means that more demolition or reuse away of this function were made than new buildings were constructed. Via this calculation one sees that only residential buildings and welfare institutions have a clear shortage of new constructions compared to the amount of functional change. They lack respectively 72.000 sqm and 95.000 sqm. Though, this doesn't seem impressive if one compares it with the 4 million sqm of new surfaces that were added during this 23 year period, one cannot forget that the last column is a netto figure, meaning that the eventual figure of functional reuse lies much higher. To truly understand the size and dynamics behind these figures, a further research on functional reuse is needed.

To support the argument for reuse per function, a own calculation is made based on the registration of the functions of buildings at the BBR (Bygnings- og Boligregistret/ Building and Housing Register). Unfortunately there are a lot of delays in registering at the BBR register, which makes it less reliable than a study on the building permits, like the study is done in Brussels. Nevertheless this study can give important trends. The ideal case for calculation the amount of adaptive reuse would be to follow the evolution of the function of every building in the zone of study. As this is not possible, a study on a more aggregated level is done. The following figures about reuse in Copenhagen are based on the evolutions of the surfaces of the buildings built in a particular 5-year period (for example buildings built from 1970-1974) with a particular function. This grouped surfaces than can be followed over a 22 years period (1986-2008). Therefore in stead of an individual building a group of buildings with a particular function and a particular age is followed. The following rule makes it possible to study the functional changes in Copenhagen:

Normally the surface of the buildings built before 1986, cannot go up in the studied period starting on January 1986, as buildings built in 1986 are added to another group of buildings[23]. By calculating all rises in surfaces for each particular category (495 in total), the total reuse together with its extensions can be calculated[24]. By compensating the calculations for the extensions made in these years, functional reuse is corrected and receives a more realistic figure[25].

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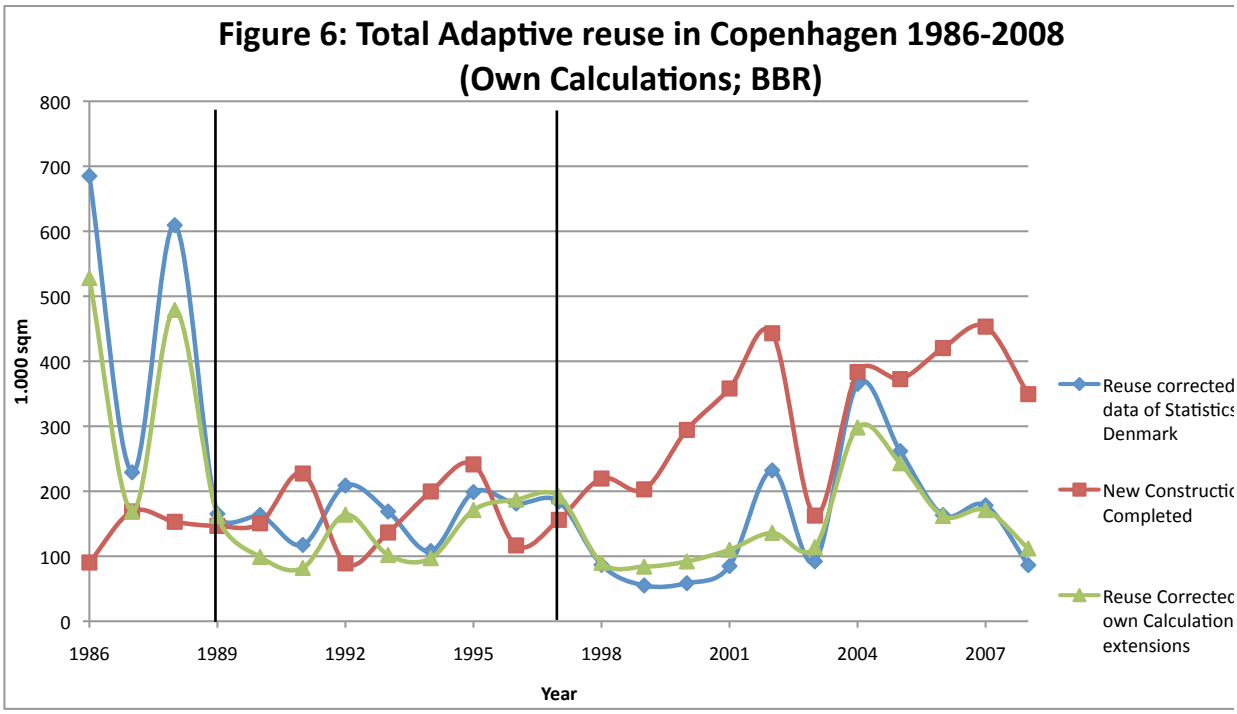
[23] The only exception for this rule is when extensions to these buildings are made.

[24] Also a reuse away from a function can be calculated via calculating all declines for a particular function. A downside of this calculation is that no data on demolitions are available.

[25] Extensions can only be partially corrected by lowering down the amount of reuse in a particular year by the surface added via extensions. There is also an inconsistency between the data on the building stock and data on extensions because of delays and bad registration of kind of construction activity, hereby the full reach of extensions is possibly not registered.



A first overall calculation off adaptive reuse is shown in Figure 6, where all presumed adaptive reuse for all functions is summed up and compared to new constructions completed. The two major peaks (1986 and 1988) at the start of the study are not seen as actual reuse as multi-dwelling houses and office buildings constructed before 1900 already count for 295.000 sqm of 'conversions' in 1988. After consulting Statistics Denmark for an explanation, a delay in registering functional change or extensions, especially for buildings built for before 1977 (the start of the database) might clarify the major rise in 1988 and 1986 (Awaad, 2010). This error will come back in the coming graphs on reuse. Using the database of the building stock I calculated my own extensions[26] and then lowered it down from the calculation for reuse. As information seems trustworthier from 1989 on, the analysis of the data will start from here.

From 1989 till 1997, one sees that adaptive reuse carries the same capacity as new construction to comply with the new functional needs of Copenhagen. Both add new usable surfaces, but adaptive reuse uses existing buildings to guide the functional change of the city. In 1998, new constructions take a leap away from adaptive reuse. From then on both are following an individual path where new constructions dominate the functional changes that are happening in Copenhagen. During this period adaptive reuse stabilises around 100.000 sqm. Only during a small crisis in the building sector in 2003, conversion

[26] Own calculation of extensions is based on the sum of every rise in surface of all 22 kind of buildings together for one age of buildings (for example 1970-1974).

and new construction come together again. It proves that new constructions are more used during times of economic prosperity, as probably not enough empty buildings are available to supply the new functional needs. Adaptive reuse has a certain maximum equal to the amount of vacant buildings, while new constructions are linked to the building capacity and the amount off available land, which also includes the replacement off an existing building. This extra capacity is well visible when the building sector recovers in 2004 and new constructions keep on rising to a 22-year maximum in 2007. Reuse only rises ones to a peak of 300.000 sqm and immediately falls afterwards. During crises times, visible in 2008, adaptive reuse declines together with new constructions.

A first important conclusion on the capacity of adaptive reuse in Copenhagen teaches that the maximum capacity of adaptive reuse lies lower than new construction. Adaptive reuse in Copenhagen typically reaches around 100- to 200.000 sqm a year, with one seldom jump above it. New constructions on the other side can easily surpass this barrier in times of wealth, as they are not dependent on the amount of available buildings. Both new constructions and adaptive reuse are crisis prone. In 2008, the start of the crisis is also a start in the decline for both activities. In 2009, which is not visible on the graph, there is a further decline in new constructions[27]. An overall trend therefore seems to be that reuse takes less advantages of building booms, but also suffers from economic crises.

Next chapters will go deeper into the dynamics adaptive reuse for the most important functions (Housing, office and industry). What is the capacity of adaptive reuse to supply new housing will be one of the major questions. Though industry and office did not have a surplus in the calculation for possible reuse (last column Table 8), they still might form a good indicator for which buildings were used to provide the new surface of residential and welfare buildings as offices and industrial buildings had the highest negative figure. Brussels might not have an overall calculation on reuse, specific calculations of adaptive reuse for particular functions were possible to make.

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[27] Reuse cannot be calculated yet as there are no figures disposable on the surfaces per function, per year of construction for January 2010.

6.2.2. Adaptive Reuse of Housing

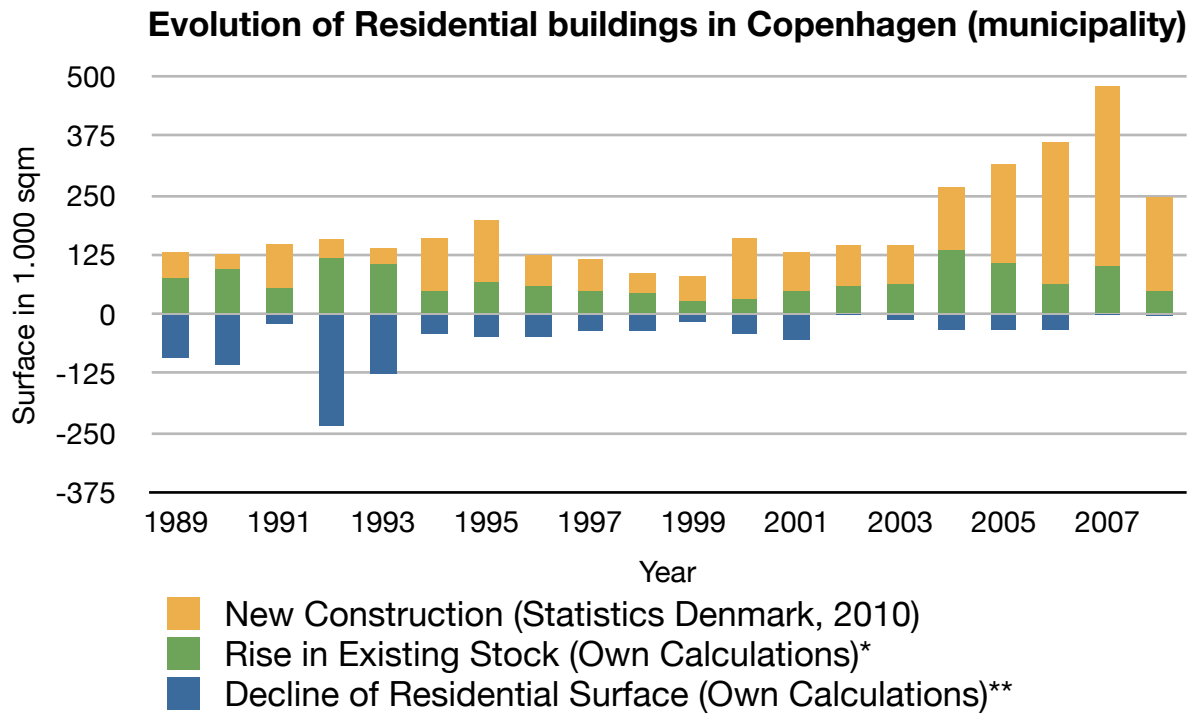
Total reuse does not tell anything about to and from which function reuse is happening. In London and Toronto, the most significant components in functional change of the city centres were office-to-housing conversions (Heath, 2001). As Copenhagen and Brussels are undergoing a population rise (Statistik Kobenhavn, 2010; Statbel, 2010), same trends can be expected.

Graphs about the evolution of a function (#) are based on the following processes:

Evolution of housing surface = Adaptive Reuse to housing + new construction of housing + extension of housing - Adaptive Reuse away from housing - demolition of housing

Delays in registration of new construction or extensions and changes in buildings from 1986-2009 can lead to inconsistencies between the overall change in a function and new surfaces added. As both come from different databases..

Figure 7



As in figure 7, decline of # surface will mean:

* Demolition and Adaptive Reuse away

While rise in existing stock consists of:

** Extensions and Adaptive Reuse to #

The evolution of housing in Copenhagen (see figure 7) has some interesting trends. The first remarkable fact is that new construction and conversion (rise in Existing stock) of housing in Copenhagen almost fell still in 1998. Then suddenly from 2000 on housing construction rose considerably to reach it highest peak in 2007. A second fact is that during the same booming period, the decline of residential surface almost fell still. It seems that after 1994 the conversion of housing to another function did not seem attractive anymore. A further research on these dynamics brings us back to 1986, when the government took austerity measures. These resulted in stricter requirements to the cash position of property buyers and borrowers. The effects did not stay away, in 1987 demand for housing fell drastically. Falling prices, bankruptcies and compulsory purchases brought housing construction to a standstill. This standstill is also visible in figure 6 for all functions together. This situation lasted until 1993, when interest rates dropped and it became easier to borrow money with property as security. Since then housing prices and demand have gone up (Kristensen, 2007). The escalation of housing prices has been most dramatic in Copenhagen (Kristensen, 2007), hereby housing prices could reach higher than the ones for offices. A conversion to housing therefore became a profitable undertaking and made offices an important supplier of new housing. Till 1993 the process still worked in the opposite way.

From 1994 on, when austerity measures were dropped, new construction of housing skyrocketed and adaptive reuse only had a slight increase. Still adaptive reuse is responsible for 31% off new dwellings. The overall capacity since 1989 (trustworthy period) reaches 38% off new dwellings. Though this figure includes extensions, it cannot be ignored that the existing built fabric is of uttermost importance for supplying new dwellings to the population.

A comparison between the municipality and the first district of Copenhagen demonstrates the importance of the historical city centre in adaptive reuse. While Copenhagen municipality had a rise of 156.000 sqm in office space, the historical city centre lost 24.000 sqm. At the same time the inner city gained 74.400 sqm of multi-dwelling houses (see Table 9). Interviewees (Ebensen, Andersen) acknowledged that for years the historical city centre is loosing office space in favour of housing, while outside the city centre new business parks are being developed. Also warehouse activity had a significant decline and explains the second part of the rise in new dwellings.

The internal restructuring of the city is linked with the physical characteristics off the inner city. During the studied period, Copenhagen had a high demand for large modern offices. As the older buildings in the city centre could not meet today's office standards and furthermore were not allowed to be replaced by new ones (protected historical city centre, see chapter 6.1), office activity moved to the canal zone where the possibility for new modern office space was fulfilled. These old offices might be obsolete for office activity, they offer a good location for housing to step in. Housing furthermore is less demanding and had skyrocketing prices, which could compete with the declining/stabilising prices off the old offices.

Table 9: Comparison between the evolutions in the historical city centre and the municipality of Copenhagen 2006-2009 (Own calculations and Statistik Denmark, 2010)

	City centre Copenhagen (First district)			Municipality of Copenhagen		
Building use	**2006**	**2009**	**Change**	**2006**	**2009**	**Change**
Multi-family	3028,5	3102,9	74,4	24769,9	25942,6	1172,7
Public institutions	1318,5	1337,4	18,9	7152,2	7336,9	184,7
Family houses	18,8	19,2	0,4	2109,7	2204,9	95,2
Hotel, Hostel, restaurant, etc..	498,4	498,8	0,4	508	500,7	-7,3
Office, commercial and storage	3987,0	3962,8	-24,2	9342,2	9498,1	155,9
Public Works	50,8	21,0	-29,8	385,4	357,5	-27,9
Production and stocks	285,4	237,8	-47,6	1969,7	1755,0	-214,7
Transport and garage facilities	135,8	155,9	20,1	544,1	628,5	84,4
Total	9323,2	9335,8	12,6	46781,2	48224,2	1443

*Institutions for pre-school children, Sports hall, Hopitals, Education facilities, Cultural purposes, Townhouses and the like

It is not the first time buildings in the historical city centre of Copenhagen are undergoing these changes. Most buildings here are from the end of the 19th century/ start of the 20th century. These buildings were designed for having retail or offices at the ground floor, more offices at the first and housing at the first and upper floors. Also workshops were possible in the ground and cellar floors. Somewhere in the 20th century a price gap in favour of offices arose, afterwards capitalist forces converted half of the city centre to offices. Now housing has regained its strength and buildings are switching back to a residential function.

In Brussels one sees a similar process going on. Though here the study is much more limited and is only based on conversion from offices and warehouses. From almost no importance, conversions to housing rose to almost comparable levels of new constructions in 2008 (see Table 10). Though, 2008 is a year where the crisis struck and housing constructions was only one fifth of the figures of 2006. If the trend of conversion to housing proceeds, and new constructions revive again, conversion from offices to housing will still play prominent factor in supplying new housing. One fifth to on quarter of new housing in Brussels can easily be delivered by converting offices. By summing up the conversion from warehouses and offices, adaptive reuse to housing reaches one third to half off new constructions. Adaptive reuse therefore also in Brussels plays an indispensable role in supplying new housing for the population.

Table 10 Comparison between new housing and conversions of offices to housing (Statbel, 2010; Sophie Coekelberghs et al, 2009)

	Brussels			Copenhagen	
	New Construction of Housing	Conversion from offices to housing	Estimation* of conversion from warehouses to housing	New Constructions	Total conversions to housing
2005	259.433	30.904	/	175.000	107.000
2006	303.786	30.117	80.000	260.000	63.000
2007	210.602	42.864	70.000	320.000	100.000
2008	62.244	48.007	/	197.000	48.000

*Estimation is based on the decline in warehouse surface

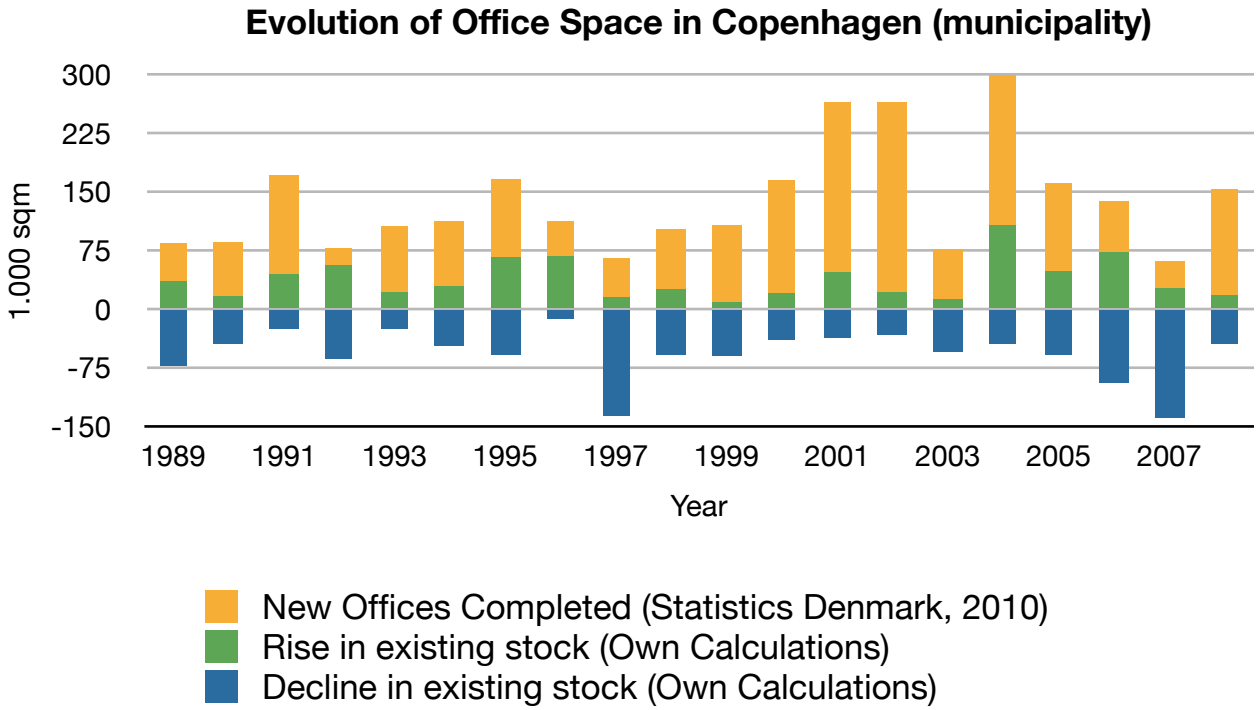
/ means no estimation is possible for this year

6.2.3. Adaptive Reuse of Offices

“All new office constructions are based on one principle: flexibility, flexibility, flexibility” (interview Anderson). If an existing office building does not fit this paradigm, it has a low chance of survival in the office market. However, they might offer ideal candidates for other uses ... if market prices are competitive.

Both for Brussels as for Copenhagen, the inner cities are still central business districts where more than half of the surface is used for offices. For Brussels 63,39% of the floor surfaces in 1997 (Urbis, 1997) were used for non residential purposes, in central Copenhagen a similar figure of 66,55% is found for 2009 (Statistik Denmark, 2010). For whole Copenhagen a seemingly contradicting story shows up: offices underwent the second most important increase in floor area and at the same time had the second highest figure for conversions or demolitions of all functions (see Table 8). Last chapter already explained part of this dichotomy. This chapter will have a closer look at these evolutions.

Figure 8



Like the figures of the overall trends and the trends for housing (figure 6&7), there is not any clear evolution till 1997. From 1997 on, new construction of offices took a clear leap while conversion away declined. During this time of economic prosperity, there was a

shortage of office buildings, hereby also the older office buildings were still used. 2002 is a turning point where conversion away started rising anew. Part of the explanation is that the balance between new offices added and needed offices space tipped to an oversupply. This led to a move out of the dated old office building in the historical city centre (grey coloured zone in figure 9) to the new office buildings in the canal zone (Brown in figure 9). As one already saw in the housing chapter, these offices were then reconverted to housing. This process is clearly visible up until the start of the new economical crises in 2008.

Still, since 1989 28%[28] of the rise in office surface can be explained by conversion to and extensions of offices. If one calculates it from 1997 on (making it comparable with the Brussels case), 23% of new office space added resulted from an adaptive reuse. These figures form a good indication for the scale of reuse, but still have to be taken with cautiousness as Statistics Denmark has many delays in registering changes in surfaces and new constructions completed.

As physical demands for offices have risen, it is no surprise that conversion to offices has declined in recent years. Though conversion still takes up an important share off new offices added. The continuing conversion activity has to be seen in the light of the declining harbour activities. Hereby old warehouses came free and offered an ideal location for large open planned offices (interviews Ebbesen, Anderson). Plh architects, one of the interviewees, is a nice example of this. It furthermore is an area that offered large plots of land, a high visibility and is placed right next to the city centre. For this reason a lot off new offices were constructed in the harbour area. It moreover became the most expensive office zone (Sadolin Albaek, 2010). Without the protection of spatial planning housing would have a hard time competing with the office prices over here. On the other side, the movement away of offices from the historical city centre, means that competition between both most dominant uses, housing and offices, is partly diverted to other locations.

In conclusion one can say that offices could not modernise in the city centre and in consequence moved the centre of the CBD to the canal zone. New constructions furthermore are more important for offices than for housing. A link that fits with the physical demands of the office function (see chapter 5.1).

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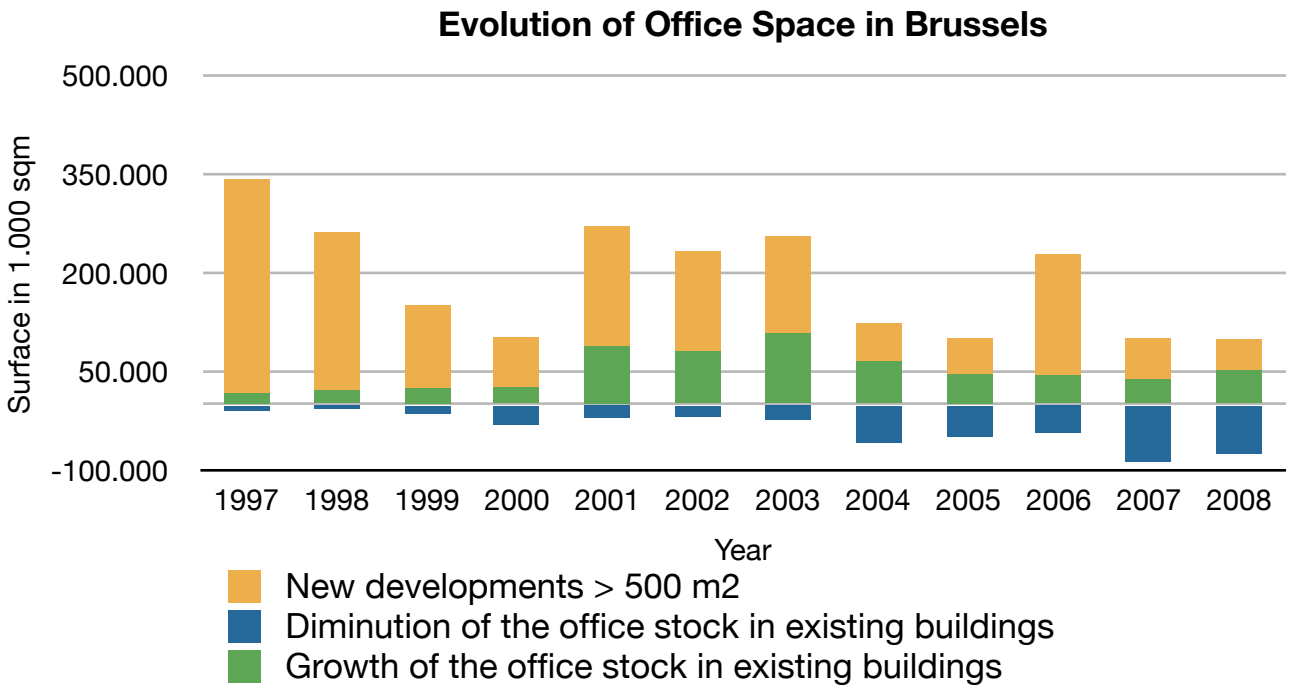
[28] Formula for calculation: (Sum surfaces conversion to offices 1989-2008)/ (sum surfaces conversion to offices 1989-2008 + sum surfaces new constructions 1989-2008)

Figure 9 The old office zone (grey) and the canal zone (brown) as the extention of the central business district of Copenhagen (Own adaptation; original Sadolin Albaek, 2010: 31)

In Brussels there is a similar trend in adaptive reuse: since 2001 conversions away from office space is on the rise [29] (see figure 10). Though, during the same period conversions to and extensions of offices were still responsible for 27% of the growth in office space, making it a non-negliable factor for the growth in the office sector of Brussels. Typically, like in Copenhagen, these are conversions of large old warehouses and workshops. Also regularisations of old conversions are still responsible for a rise in surface[30]. Though in 2008 it was only responsible for 5.600 sqm of office space added.

Figure 10 (Data source: Coekelberghs & De Beule, 2009: 4)



Conversions away from offices is still a recent phenomenon in Brussels as before 2000 it was almost zero. For a long time there was no need in new housing as population was falling in Brussels, above this housing in the city centre had considerable lower prices than office real estate. Last years, housing prices together with the number of inhabitants have been rising considerably, hereby Brussels is experiencing two trends for office: conversions away from offices mainly for housing (65% of conversion projects, see appendix

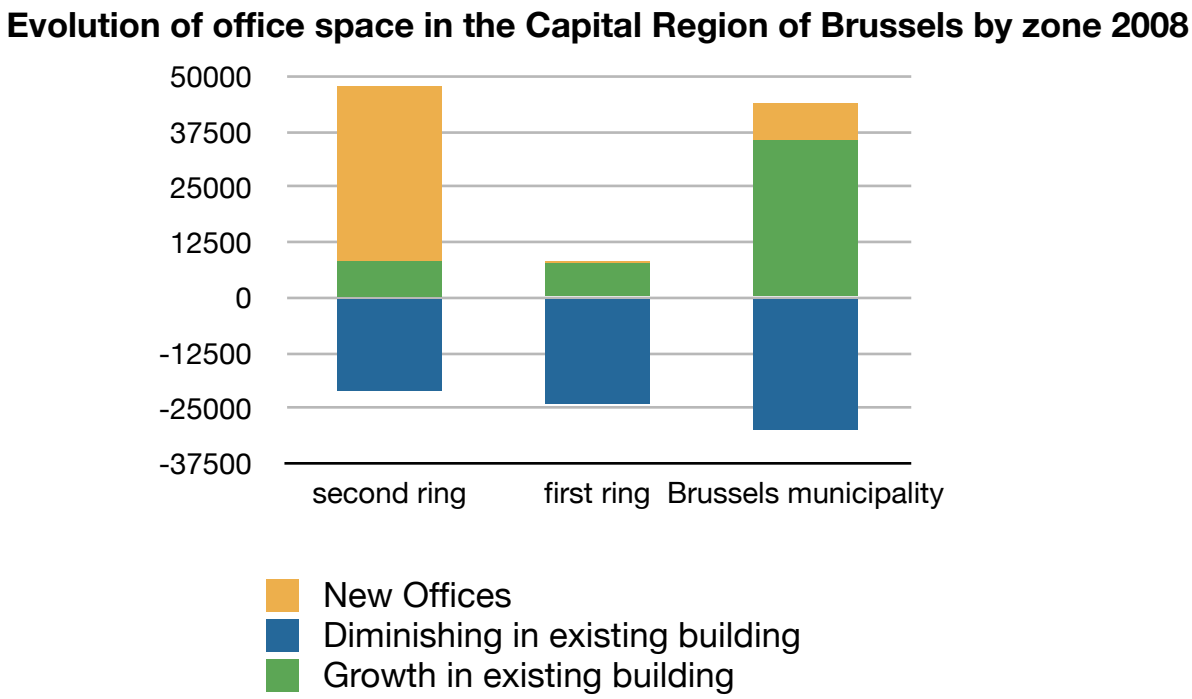
[29]Diminishing can be partly demolisment of the building, but is seldom (Coekelberghs, 2009)

[30] Till 1992 change of uses did not need a building permit in Brussels, conversions happened before this date can be regularised.

9.5) and conversions to offices from workshops and warehouses. Seldom a house is converted into offices as housing is a protected function (see 6.1).

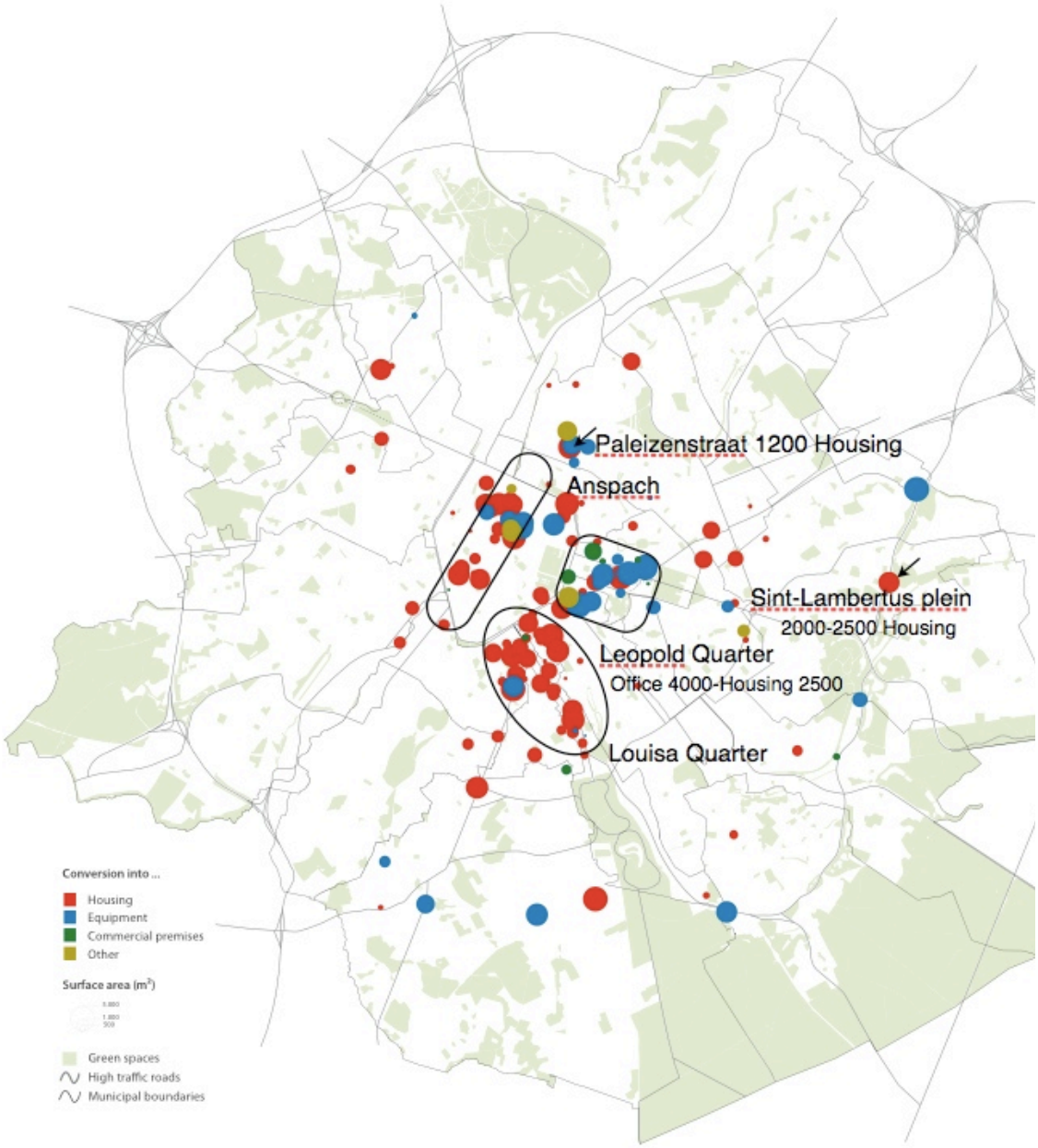
A dissection of the trends inside Brussels for the year 2008 show that conversion is much more important in the city centre (municipality of Brussels = first district of Copenhagen) than new constructions (see figure 11). In the first ring of municipalities around the municipality of Brussels (see appendix 9.3 for localisation three rings), almost only conversions were made and no new construction, resulting in a decrease of office space in this ring.

Figure 11 (Data source: Coekelberghs & De Beule, 2009)



In the second ring new offices are still being constructed and conversion is on its lowest. Two Municipalities, Sint-Pieters and St-Lambrechts-Woluwe make up 75% of the conversions away from office in the second ring. This can be explained by the fact that two municipalities are known for their expensive housing, hereby housing prices can compete with offices prices. Above this office prices decrease from the city centre on and therefore offices are already cheaper here than in the Central Business District (North, Pentagon, Leopold and Louise = municipality of Brussels). For this reason housing in St-Lambrechts-Woluwe can cost up till 3.500 Euro/sqm, while offices only go up to 2500 euro/sqm because of its decentralised location.

Figure 12: Reconversion of offices larger than 500 sqm from 1997 till 2007 (Coekelberghs, 2009; own comments))



Looking at the map of conversions of offices made from 1997-2007 (figure 13), most conversions to housing happen in central residential areas (Mixed areas and housing areas) (Coekelberghs & De Beule, 2009). This means that popular urban housing areas are regaining importance and can even push back some of the office function, while pure mono-functional office districts like the Leopold quarter only have few conversions (see Table 11 for price differences). Here most conversions are linked to embassy activities (listed as equipment, see figure 12). Mono-functional districts therefore are not undergoing

thorough changes and becoming more mixed. A problem that certainly has to be addressed.

Brussels has a much higher competition between offices and housing in the historical city centre then in Copenhagen. First off all there is a high presence of large open-plan office buildings that are up for refurbishment to present day standards. Offices therefore are remaining in the city centre. This is only possible to a lack of spatial planning up until 1998 (Dessouroux, 2010).

Only on the Avenue Louise and some quarters in the city centre like avenue Anspach, Southstreet housing can compete with offices. Avenue Louise is originally a housing neighbourhood, where old mansions have been converted to offices. Recent years have shown that housing function can compete with offices as the offices are not always able to be brought up to new standards or the plateaux of the buildings are too small to be economical viable. Same reasons can be found for some zones of the pentagon.

Table 11: Comparison of Real Estate characteristics of Copenhagen and Brussels

	Copenhagen	Brussels
Average Price for housing	2688 Euro/ sqm (Kristensen 2007) 3056 (GPG, 2010)	+- 1500-1800 Euro/ sqm average (interview Ottevaere)
Central location Prices for owner occupied housing	€ 4291/ sqm (GPG, 2010)	€ 2,465/sqm (GPG, 2010) € 2300-2800/sqm (Van Mierlo, 2006)
Square Metre Price in central locations	Less than housing in the historical city centre, waterfront more than housing (interviews Anderson & Ebbesen)	3000- 4000 (Interview Ottevaere)
Prime office rent (CBRE, 2010)	228 Euro/ sqm/ year	265 Euro/ sqm/ year
Owner occupied housing	19% ((LAURIDSEN, and SKAK, 2007)	42% (FOD, 2001) 69% (FOD, 1981)

* Based on interviews

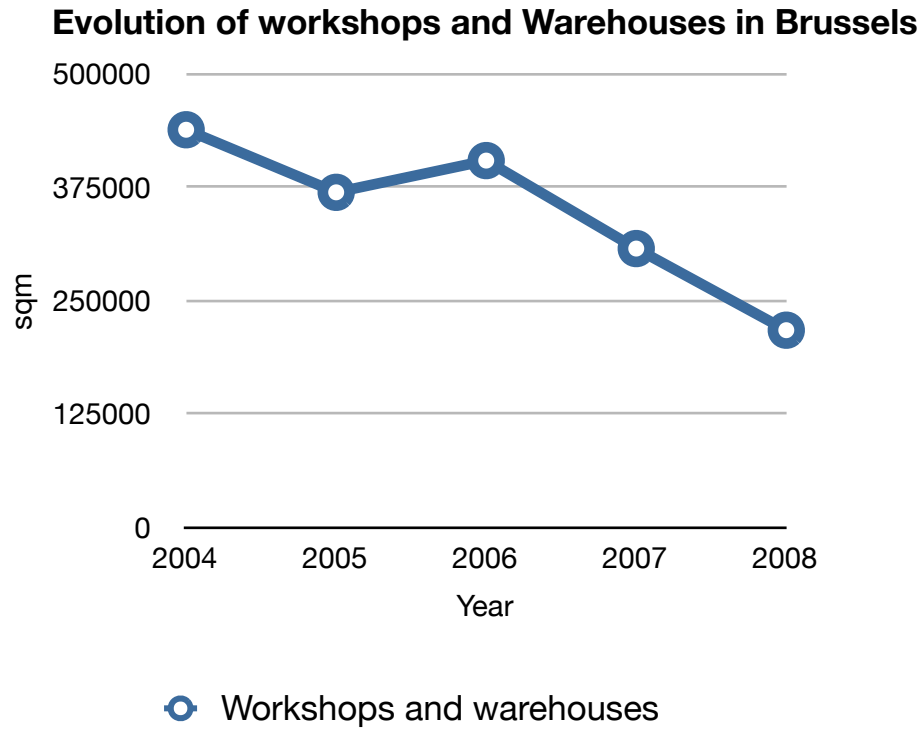
A downside of the creation of housing out of offices is the price for a conversion project. In consequence one sees that housing out off offices are not a supplier for young middle class families. Both Brussels and Copenhagen have a huge problem in the availability of cheap housing. The cheapest location for offices in Brussels are also the places where nobody wants to live. Woluwedal, Avenue Kolonel Bourgh and Marcel Thiry are three examples of cheap office location with high vacancy (+- 20 %, Doornaert et al, 2010), but without any urban atmosphere or equipment for possible inhabitants (no schools, kindergarden, doctor, ...). A conversion to housing in these locations is therefore only desirable when the government makes serious investments in public equipment for these place.

6.2.4 Adaptive Reuse of Warehouses and Workshops

One of the functions that underwent serious changes in absolute and relative shares are the surfaces linked to workshops and warehouses in Copenhagen (see Table 8) and Brussels (see figure 14). Last chapters on conversion of housing and offices already talked about workshops and warehouses as one of the main sources for conversion. This chapter will thoroughly investigate the loss of industrial space.

For Brussels figures are based on a research made by Verbrouck (2007) for the Regional Development Company of Brussels (GOMB-SDRB). Between June 2006 till January 2008, Brussels lost 172.026 sqm of warehouses and workshops. This means an average loss of 8.601 m² per month, which equals a cut down in half in only 20 months. Though one huge demolition project of 30.000 sqm in the municipality of Brussels dominates the figures, most other activities were the conversion to lofts (figure 15). Conversion of warehouses to lofts is a recent phenomenon as between 2000 en 2004 the evolution of warehouse activity was quite stable (Hansens, 2008). Till 2000 the population was still declining, after some years a tension for new housing was built up.

Figure 13

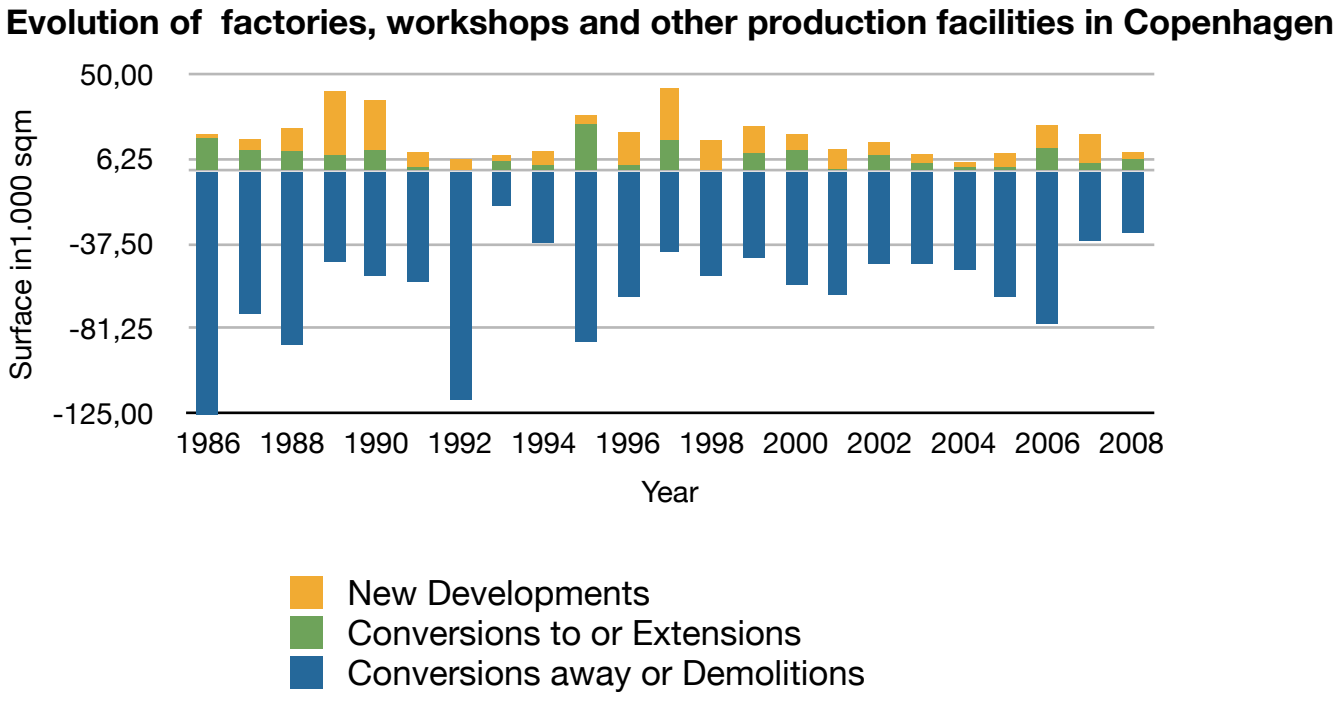


For warehouses the price-gap with housing is opposite to offices-housing; housing is higher priced than warehouses. Capital forces therefore are pushing adaptive reuse from warehouses to housing (and offices) as the legal framework allows this without any change of plans. Though in Brussels this decline poses a threat for companies who want to continue their activities as the availability of warehouses and workshops has declined significantly in a short period while there is still a demand for this function (Gomb, 2008).

A major decline in industry is also visible in the centre of Copenhagen, Christianshavn (part of the city centre) and to the north of Nyhavn (see figure 9 - brown for old brownfields next to the canal), major warehouse were converted into housing and offices. In only three years this function went down 17% in the first district, but is certainly not comparable with the decimation of warehouses for the whole of Brussels. The whole of Copenhagen saw a decline of factories and workshops of 'only' 36% in 23 years.

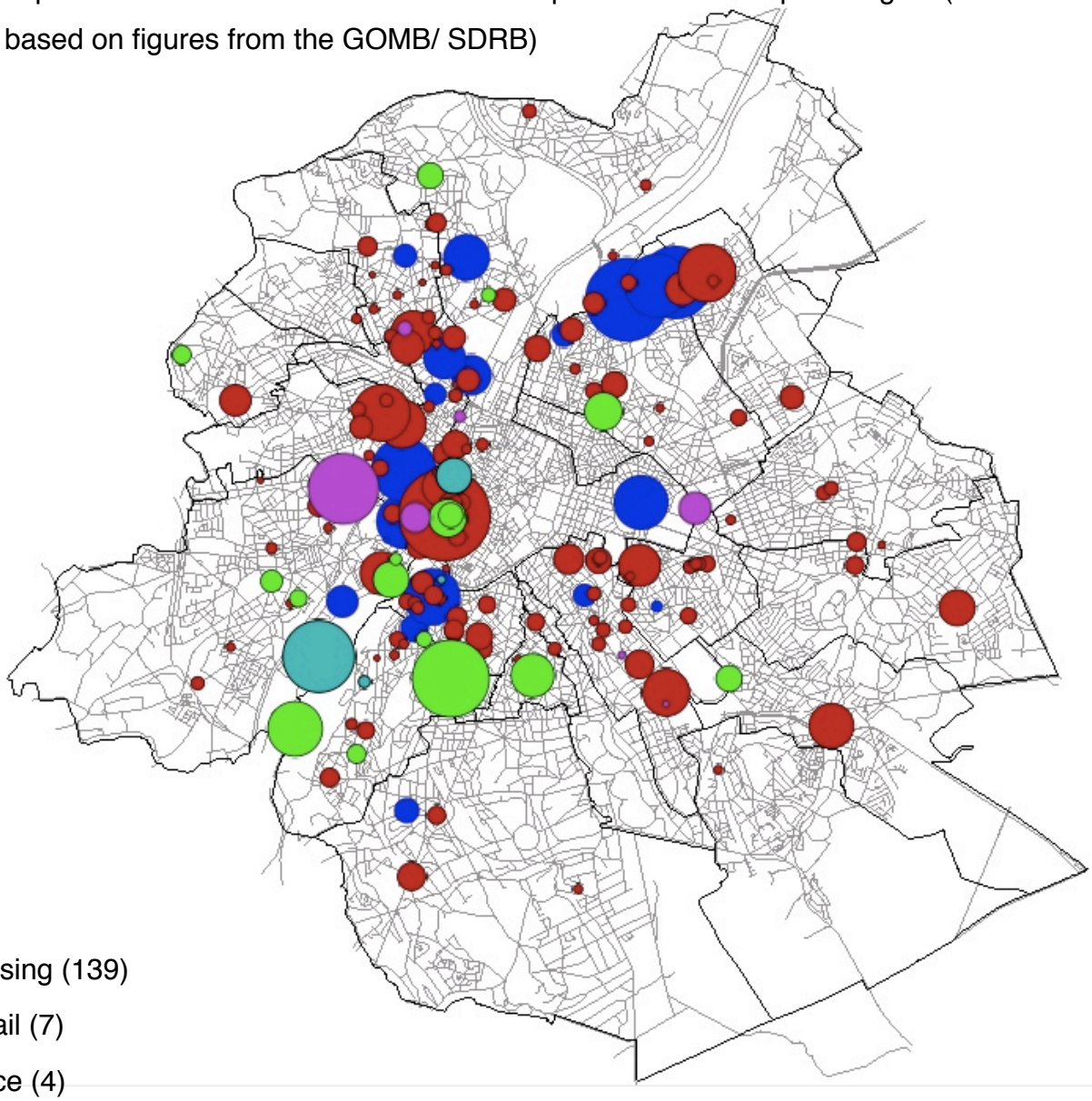
Figure 14 proves that not much new construction were added and that the 23 years were dominated by negative figures of adaptive reuse or demolition. From 1995 a decline in demolition or functional reuse is visible until 2003, from then on demolition or functional reuse accelerated till 2006. The high-loss from 2002 till 2006 more or less follows the time when office and housing conversion and construction boomed. Hereby the link between workshops, housing and offices can be proven.

Figure 14



In Brussels the major part of projects had one destination: the total conversion to housing (see figure 16). A location analysis (see figure 15) learns us that most conversions happen within the 19th century industrial belt bordering the historical city centre of Brussels. Hereby the canal zone is almost visible as a straight line.

Figure 15: Adaptive reuse of warehouses and workshops in Brussels Capital Region (Own calculations based on figures from the GOMB/ SDRB)



Housing (139)

Retail (7)

Office (4)

Mixed (22) (Mostly Housing-Offices, or housing -retail, or office-retail (1) or offices, housing and retail

Other unknown ((16) of which 4 Religious building)

* known demolition projects are excluded from the map

In comparison to Copenhagen only few companies have localised themselves next to the canal in Brussels. This was the area for the poor people as manufacturing industries were located here, while the higher socio-economic classes were literally located on the higher eastern side of the historical city centre. As office development is linked to places of high standing, they followed the places where the higher classes were living. In consequence one sees that the CBD of Brussels is not linked to the old industrial areas like in Copenhagen. Only to the north of the canal area there is a small link with the Northern side of the CBD. As offices are not interested in most of the canal zone, housing can freely take over the warehouses.

Also to the east of Brussels, in the Maelbeekvallei, the valley of an old river, major conversions are taking place and this foremost to housing. Here the size of the conversions might the explanation as surfaces here are too small to be workable for offices. A remarkable mentioning in all the industrial conversions was the conversion of four warehouses to religious buildings. This is probably a conversion to a Mosque as empty churches in Brussels are now becoming supplier for i.e discotheques (Spirito Martino in Elsene).

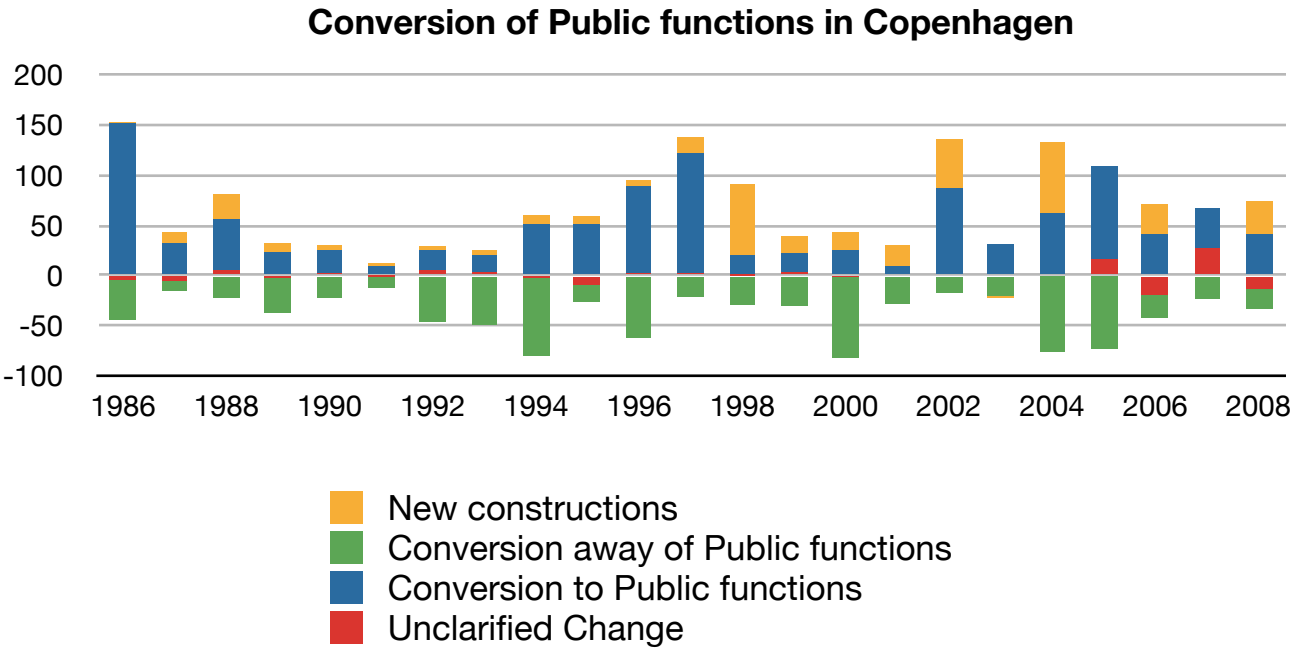
It is clear that almost no conversions happen at the periphery of the Brussels Capital Region, an uninteresting place for urban dwellers. In recent years these locations even had an extension of warehouse activity. In april 2010 warehouse and workshops again reach 388.564 sqm (Inventimmo, 2010), this is thanks to 2 huge atypical projects who together added more than 100.000 sqm: Canal Logistics en Katoen Natie. This trend shows how warehouse activities are competed away from the city centre, but still have a chance to survive in the more the peripheral locations where one has a good access with the highway, airport and/or canal. This rise proves there is still a strong demand for workshops and warehouses. Most conversions happen in zones for housing and zones of mixed use where a conversion can happen without the adaptation of a land-use plan (Verbrouck, 2007). It are the same land-use kinds that also do not offer a problem for conversion between housing and offices. Brussels therefore will have to take protective measure to keep this function and therefore also a mix of functions in Brussels alive. A conversion of small warehouses might still be opted for as they are less economical to govern.

6.2.5. Conclusion on Adaptive Reuse in Copenhagen and Brussels

Studying adaptive reuse in Brussels and Copenhagen has learned that it is certainly not a limited process, but takes active part in the evolution of cities. Housing does not only seem to have the highest legal possibility for conversions, it also actively uses its legal capacity to convert old offices and warehouses to supply new dwellings. Depending on the location and physical characteristics of the building, warehouses and workshops will be a supplier for office space or for housing. If office buildings become obsolete, they mainly change to housing when the location for an urban lifestyle is right.

As only the three most important functional changes are discussed between offices, housing and warehouses/workshops, one cannot forget that also public functions, hotels , etc take integral part of the process. In Brussels 11% of the office space converted to other uses were converted into hotels (Coekelberghs & De Beule, 2009). Also in Copenhagen public functions[31] are dominated by extensions and conversions of buildings (see figure 16). Further research on other functions is needed to know the geographical location and scale of these kind of conversions.

Figure 16 Functional reuse of Public Functions in Copenhagen (Own)



[31] Consisting of libraries, museums, churches, buildings for education and research, building for hospitals, homes, maternity homes, day-care institutions, non-specified holiday purposes

6.3. The Future of Adaptive Reuse in Brussels and Copenhagen

History tells us which places are prone to change and give a good indication for what the future may bring. A first important fact that influences coming adaptive reuse is that new offices, housing and industrial buildings are much more specialised than their predecessors (interview Anderson, Nielsen). High rise apartment buildings are full of concrete slaps that make a reuse more difficult (see 5.1), while new industrial buildings are cladded with metals plates and have a very light and demountable structure, modern office buildings on the other side have a specialised technical infrastructure. When these buildings become obsolete for their functions, it will be a challenge to adjust them. Though, office buildings have the best option because they have an open plan and are planned with the highest rate of flexibility (interview Anderson).

As this study proved that old industrial areas and old smaller (brick) offices are not seen as ideal places for production facilities or new offices, it seems a natural process that these buildings continue to evolve to housing; a rising function with less physical requirements. A study of CERAA (2008) furthermore illustrated that old industrial buildings mostly do not have any problems of being reused. The value gap between the central located workshops-warehouses and offices-housing makes it a profitable undertaking. Therefore especially the centrally located industries are expected to continue their conversions in both Brussels and Copenhagen.

In Brussels one sees that spatial planning in the city centre is not of any objection to this change, Copenhagen on the other side has to wait for a local or municipal plan to allow further change of the warehouses in the harbour area (see 5.2). The first district of Copenhagen will have no warehouses or workshops left in 15 years if present trends continue to exist. A figure that is approaching fast. The city centre of Brussels only has 14 warehouses left or a total of 7,431 sqm. These warehouses will probably totally disappear in the next years. Also attractive bordering districts will continue to loose their warehouse activity: Sint-Gillis, to the South of the pentagon also only has 13 warehouses or workshops left. Owners of warehouse in the city-centre almost immediately sell (Verbrouck, 2007).

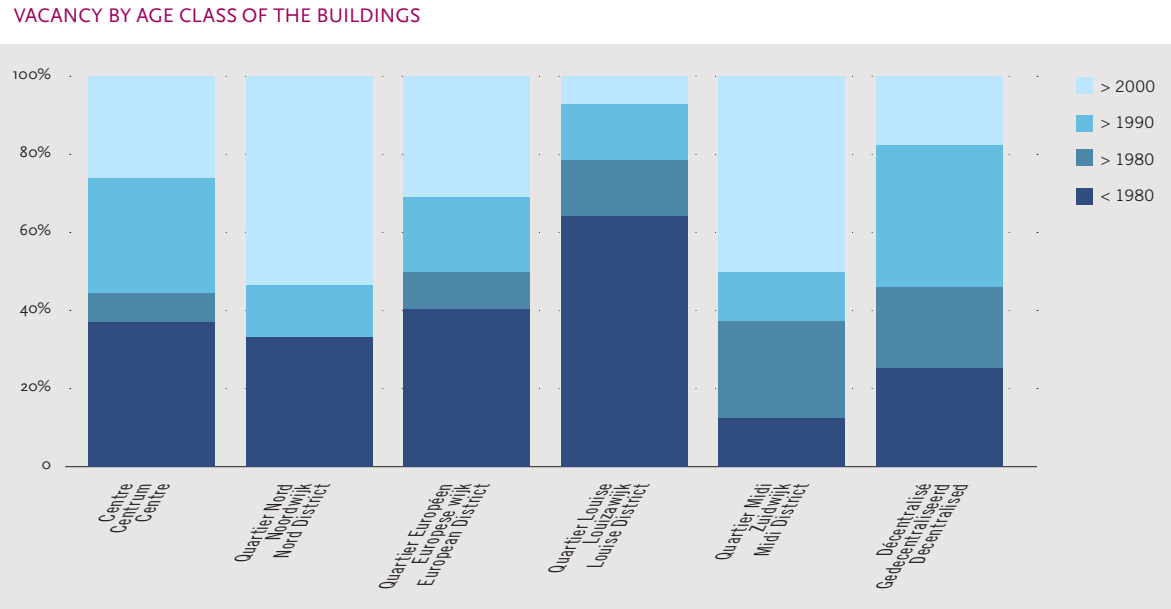
Looking at the office real-estate market both cities will undergo a physical restructuring to house modern facilities. The city centre of Brussels differs from Copenhagen by having large open-planned office buildings that can be renovated, while Copenhagen only has brick structures. Therefore Copenhagen will have more conversion candidates.

At this moment both central office markets have the lowest vacancy rate (Doornaert et al, 2010; JLL, 2010; interview Ottevaere; Sandolin-Albaek, 2010), adaptive reuse at first sight therefore does not seem to have many candidates. Though these buildings are getting old (Statbel, 2010; Statistik Denmark, 2010) and companies move out to new districts (Dirckx et al, 2009; interview Andersen), but via price reduction these spots are still occupied by new companies. Copenhagen still offers an attractive office location “for occupiers that seek attractive surroundings in a unique city”(www.investindk.com). If prices continue to decline in the old central offices space, housing function may definitely overpower offices in a large part of the historical city centre. A new crisis in the office market via an overproduction of new offices outside the city centre may lead to a new wave of conversions in Copenhagen.

Brussels, as already mentioned, has a mix of offices. The smaller offices are not that interesting for international investors (interview Ottevaere), while the large office buildings stand a good chance to be updated to modern standards as their location has a high amenity value. A large problem for Brussels is that only high class housing may be able to compete with office in central locations. One particular neighbourhoud seems to offer a lot of opportunity for conversion: the Louise district. The local cleaning up of old vacant offices in the Louisa district already went pretty fast last years, hereby there are no offices anymore with an uncertain future[32] (Doornaert et al., 2009). In addition the Louisa district offers the most possibilities for future adaptive reuse, more than 60% of the buildings are older than 30 years or have not been renovated for 20 years (see figure 17). Soon their leasing contracts will be finished and these buildings will have to be renovated if they want to remain office. As most of them have small plateaux and therefore are less economical for offices, a conversion stands a good chance against renovation. Moreover, the higher housing prices in this district allow a better competition with offices than in the rest of the city. Therefore, most opportunities for conversion to housing can be found here. Also the city centre has around 40% of old office buildings, but the size of the buildings makes the story much more ambiguous.

[32] Vacant for a long period

Figure 17 Vacancy by age Class of the Buildings (Doornaert et al., 2009:10)



For getting an idea for the future potential for the whole of Brussels I first want to make a mentioning of two previous studies: one from the previous minister of territory and housing (BRAT, 2007) and the other one from ministry of economy and employment, that made a study together with the ministry of the environment and energy. The first research estimates that the present and near future vacancy offers a potential of 350.000 sqm or 1200 housing units for conversions. This is a prudent estimation as offices in the Leopold, Northern district and decentralised location are excluded from this estimation. The study furthermore showed that the majority of converted buildings was constructed between 1950 and 1970. The exclusion of larger surfaces (> 30.000 sqm) is a realistic envisioning, as larger buildings are in the hand of international investors and have a too specified structure and size that give them a good chance of remaining office space.

The second study of CERAA (2008) is based on the idea that the need for extra office space will not rise much in the coming 15 years, but new offices will keep on being constructed on a steady pace. The reason for the stabilisation in the needed office space is linked to the more flexible working environment that has let to a more efficient use of space: employees do not have fixed offices anymore, there is less need for storage, more tele-working and other working practice innovations. As new offices will keep on being constructed to support new and more specialised needs, old offices will undergo a fierce competition to attract new occupiers, pushing prices down for less functional old offices.

As seen before, a lot of old office have to be refurbished before they can find a new occupant. The study estimates that potential candidates will move to new modern office buildings in stead a refurbishment one, hereby a vacancy of up to 4 million square meters is created. Following the indicators of the previous study of BRAT (2007)[33], more than 14.000 flats can be created out of reuse, resembling a huge potential. This means that for the coming 15 years, the conversion of offices can keep on supplying an important share of needed housing. I tested this potential at a real estate consultant. Mr. Ottevaere (real estate consultant) expressed his disbelieve in this potential as he sees more existing offices being refurbished back to modern standards. Above this housing prices cannot yet fully compete with office prices in most office areas of Brussels. Though, good office locations will remain good housing locations, without support of the government, the potential for converting offices into housing cannot be addressed. Above this a further rise of housing prices till the price of offices looks a far away dream for Brussels as a gap with the cheaper housing prices in the hinterland will create a new surge of suburbanisation.

Present economical crisis offer a huge potential for reuse in both cities. The economical crisis speeds up the above mentioned process of making old buildings vacant, because companies who are occupying these buildings seek opportunities to take up new offices for the same price as their present occupation (interview Ottevaere). The emptied out buildings will have a fierce competition as prices are under pressure. New constructed buildings have to be rented, while old buildings already earned their money and an investment for refurbishment therefore can wait. The present economical crisis is therefore heightening the probability for reuse. As vacancy is standing at 10% in Brussels and crisis continues, planners and politicians were asking for a moratorium on new offices. Brussels minister-president Picqué is not for a moratorium on office construction, first of all he fears that it will harm the competition with Flanders and Wallonia (Degreef, 2009). A moratorium on office construction furthermore might also harm the possibilities for the conversion of offices to housing as offices will remain in their present locations.

In conclusion one sees that conversion still has some potential in both Brussels and Copenhagen. Especially the conversion of offices to housing has only started. Many possibilities for conversion will come on the market as buildings are getting more and more aged. Also trends show that industrial buildings in the city centres will be filtered out by

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[33] 291,66 sqm per flat. This looks quite high because common rooms like stairs, hallways included)

market forces and will be obliged to move to the periphery of the city next to the highway and/or canals. Though in these locations a better protection of the weakest functions has to be guaranteed as it helps to supply the city and creates jobs.

Table12 (own)

Function	Present conversions to	Geographical location	Future posibilities
Housing (H)	To H: mainly from offices and warehouses	Central districts and old industrial zones bordering the historical city centre.	Highest possibilities of three functions for further. Lot's of old offices in both CPH and BRU for conversions. Especially when overproduction of new offices continues.
Offices (O)	To O: mainly from warehouses	Brussels:conversions only in CBD and bordering CBD. CPH has conversions to offices in the Canal zone.	little possibilities for new conversions to offices as major warehouses have been converted or are too specialized. No possibilities for converting housing to offices in BRU and not feasible in CPH.
Warehouses (W)	Only from W	/	Still room for further conversions away from warehouses and workshops both in BRU and CPH.
Retail	Most conversions in mixed projects with housing and offices	too few knowledge on subject	Ground floor conversions on main axes is a possibility

6.4. Investors in Brussels and Copenhagen

Now we know what the potentialities for the future are, one can ask himself the question, who is going to be the investors in this process?

The study of BRAT (2007) makes an important remark about the proprietaries that offer the largest opportunity for conversion in Brussels. The occasional proprietary, mostly linked to a joint stock company, are seen as the biggest opportunists of the market that want to take the challenge of adaptive reuse. First they do not have the relational context as their large institutional and professional competitors to renovate and rent their office buildings. Secondly, they do not have the same financial power as their competitors. It is therefore not unimaginable that they diversify their activities to more risky sectors (see chapter 5.2.4) where they can earn money on. Institutional owners, professional and international investors furthermore are only interested in exploiting offices because (BRAT,2007):

1. Housing has inferior yields compared to offices
2. Housing is much more complex than offices. One office building of 10.000 sqm can be easily rented or sold to 1 owner, while a 10.000 sqm apartment building needs 100 buyers or renters (and then also checking 100 contracts).
3. Housing is highly regulated (compared to offices)

Factor 2 and 3 are the same for Copenhagen, and here investments in housing do make sense for international investors, the importance of return on investment is therefore of primary importance. This also might be the reason why Brussels has high amount international investors in the office market (over 50%) while they are almost absent on the housing real estate (Dirckx et al, 2009). One of the reasons might be that the rental market in Copenhagen is much wider (more different income groups) and larger than in Brussels (see table 10). Brussels also has a much more complicated housing market than in Brussels, just because of the absence of large investors. This peculiarity for Brussels (and Belgium in general) is linked to prohibition of investment funds to invest in real estate up until the middle of the nighties. Hereby pension and other investment funds are and were more prominently active in the other European markets, like Copenhagen. In consequence it is more typical for other European cities to have whole street-blocks built full of the same apartments and/or housing and this by the private real estate market. Only the last 15 years Belgium came under the scope of investment funds via the start of investment com-

panies with fixed capital. Hereby Belgium lagged 40 years behind the Netherlands, Zwitserland, UK and others. The other peculiarity of the Brussels real estate market is the low level of sales, a buildings is averagely only sold every 36 years. This is because of the high registration cost for buying a property. Both factors are making the house market less transparent and difficult to overview than in the rest of Europe, thus keeping away investors (Baltussen, 2010).

The conversion of offices, industry or other to housing will therefore be a case of smaller and local investors. It is furthermore not weird that Brussels is also giving subsidies to groups of families who want to buy up an old industrial building and refurbish it to housing, as large scale investors see it as risky.

Interviews have proven that conversion of buildings is a specialisation as informal negotiation goes hand in hand with getting a building permit for a conversion. When architects, developers and state know each-other's way of working, the process of conversion goes much more easier(interview Ebbesen, Macgregor). Developers and architects therefore are chosen carefully on their experience with these kind of projects.

Developers are much more powerful in acquiring properties, as they can wait longer than a normal private person, have the capital to do it and adjust the aim (function) on a project by project basis. They furthermore know how the system works and the system knows how they work, a consensus therefore is more easily reached.

Public sector is not only the actor that makes the rules, they mostly are large real estate owners, such as railway companies, telephone, post, even the military, governmental and other public institutions. Trends in Vienna, Copenhagen demonstrate how governmental institutions, mostly located in the city centre, move out of their older offices to gather them in larger more efficient buildings at the edge of the city where new constructions are possible. By restructuring and streamlining these institutions, large amounts of property will become vacant and offer a significant opportunity to do functional reuse of buildings.

Almost 10% of all building projects undertaken in the city of Brussels are governmental projects (www.brusselnieuws.be 21 Januari 2010). They hereby have an important influence in determining the future trends in the building sector. Via the BRDA, Brussels is also responsible for a large share housing construction. They therefore can play an important role in promoting reuse and trying to convert office in less profitable areas, hereby keeping the conversion market open for all social classes.

In Denmark governmental functions are also moving out of the city to other parts of the country. Though, Government and ministries are staying in the city centre of Copenhagen. Brussels moreover has governmental institutions of international, national and local level, which makes the public sector one of the most important actors for Brussels. Belgian, Flemish and French community governmental institutions want to be located in the city of Brussels as a symbol. Governmental functions in Brussels therefore will probably stay and refurbish their old office buildings or search new locations in the city center. In general a lower chance for converting governmental buildings can be found. Though one huge governmental building, the Empire's Administrative Center (Rijks Administratief Centrum), will be one of the largest conversion project undertaken in Brussels. Part of the buildings will be destroyed and replaced by new buildings, part will be converted.

To conclude one sees that Copenhagen has much more international developers active on the conversion market to housing while Brussels has many private actors. This leads to a different functioning of the market. The governments furthermore play an important role in not only allowing but also in inducing reuse as they take up an important share of construction activity and office use.

7.Conclusion

7.1. Synthesis

Adaptive reuse plays a significant role in supplying the new functional needs of Brussels and Copenhagen. One third of the new dwellings added were provided by adaptive reuse. Even one fifth of new office space came from reusing other buildings. Most of these conversions happen within the historical city centre, as the physical characteristics of the buildings together with a rising population support the process of adaptive reuse.

The change of standards in the office and warehouse sector was an important trigger for adaptive reuse. In both cities one saw that old, non open-planned small offices lost their feasibility for services. Today these less economical office spaces offer an ideal location to house the rising number of urbanites. Physical obsolescence for one function, can mean an opportunity for another one. Housing has been the biggest winner as it is less demanding than office and warehouse activity and moreover has a huge market to supply to. Above this, the legal framework was most supportive for allowing new housing to sprout up and replace offices and warehouses. Housing itself on the other side was well protected in it's own land-use kind, in Brussels a reuse away from housing was not allowed without compensation. Though retail can also play an important role on functional reuse, insufficient data and study has been made around this function to draw further conclusions. In general both land-use plans allowed a considerable amount of conversion to happen within the city. Brussels gave more opportunities in spatial planning to do adaptive reuse than Copenhagen as Brussels offered more options for warehouses to convert to housing and offices. The possibilities created by spatial planning therefore were also visible in the actual reuse, where housing was the most used reuse.

Though the legal framework created many opportunities for adaptive reuse, both cities only have a limited awareness of the process. By giving a lower VAT-level for refurbishment, Brussels unconsciously has given more financial support for the process of reuse than Copenhagen. Copenhagen on the other side has a better legal framework to work in; they have one standard for heated buildings and less dispersed power than in Brussels. Hereby Copenhagen can better elaborate specific policies for adaptive reuse. Still both cities have a lack of policies and sufficient information to fully support adaptive reuse.

When the legal framework allowed a conversion, capitalist forces guided the process. Hereby stronger economical functions pushed out the weaker. As capital forces can cut the warehouse and workshop surface of Brussels in half in only two years, cities have to im-

plement protective measures to preserve wanted functions. In Brussels one saw that the now stronger housing function can push out warehouse activity. This is a cause of the spatial planning system of Brussels that is constructed around the idea of protecting the residential function from the powerful office real estate sector, and not for protecting other functions from housing. To prevent the disappearance of a wanted function, a balanced spatial planning should enforce a minimal amount of surface for each wanted function. Copenhagen already has a more balanced urban planning where all functions are protected in one type of land-use, though this is limiting the flexibility and spontaneity of the city to a certain degree. Spatial planners therefore have to think carefully to which extent they allow cities to change.

At the moment market conditions are more favourable for Copenhagen. Housing prices in the city centre of Copenhagen are competitive and surpass office prices in many places of the historical core. Brussels on the other side has a much more ambiguous story for the inner city. Though there are spots where housing and offices are competitive with each other, the general pictures shows that housing has significant lower real estate prices. Brussels will have a difficult time for allowing more adaptive reuse to arise via a natural price competition as there is a fears competition with the surrounding regions and a large share of the population cannot pay for higher housing prices. Already one saw that most conversion projects from offices to housing were aimed at the higher classes. Both cities therefore have the challenge to elaborate policies so adaptive reuse will have a positive social result on the city.

The restructuring of the office and warehouse-workshop sector also had an important geographical impact. In Copenhagen this led to a partial move off the central business district (CBD) from the historical city centre to the canal zone as the historical city centre is fully protected and replacement by a built-to-suit was not allowed. Brussels also has many obsolete offices, but past urban restructuring allowed large open-planned offices to sprout up in the middle of the historical city centre. Here an oversupply of offices and obsolescence of the oldest office district, the avenue Louise, is pushing adaptive reuse of offices. The most mono-functional part of the CBD on the other hand is not undergoing adaptive reuse and becoming more mixed, here market prices for offices are still too high to allow housing to compete away part of the office market. Adaptive reuse of offices in Brussels therefore has a more narrow geographical zone than Copenhagen.

Also warehouse activity has evolved. While warehouses bordering the historical core of Brussels were being transformed into lofts, new huge warehouses were developed in the periphery. The main reason why these warehouses were converted into housing and not into offices is because Brussels' office real estate sector was not interested in the West side of Brussels, as it was disconnected from the CBD and had a 'bad' reputation. It therefore was perceived as risky to locate one's offices over here. Housing in consequence had few competition from offices. In Copenhagen on the other side, the CBD and the canal zone lie next to each other, hereby the powerful office sector seized control over much of this zone. Same causes, a changing office sector, therefore can have different results. This means that location influences the kind of adaptive reuse. Next to location one sees that the physical characteristics furthermore guide the geographical location of adaptive reuse. Hereby Copenhagen supports more adaptive reuse than Brussels as the central office sector in Copenhagen had less options for modernisation.

Not only the market conditions and physical characteristics created a different result in the process of reuse, the actors furthermore are influencing how the market works. In Copenhagen international developers are much more active in the housing real estate sector than a private person, while in Brussels reuse activities to housing seem to be guided by local families and small entrepreneurs. The office sector on the other hand is very international in both cities, in Brussels a switch from the international office sector to the local housing sector therefore might create an extra threshold for further housing developments out of offices. The different market conditions and actors in consequence will need different kind of policies to support adaptive reuse. Brussels for example will need more fiscal advantages or subsidies to bridge the gap between housing and office prices.

The state of the economy is a last factor that has to be taken into account in the process of adaptive reuse. In times of economic prosperity adaptive reuse does rise, but takes less advantage from the investments in the built fabric than new constructions. This is linked with the limited amount of vacant space that can be adapted and reused. Therefore in times of economic prosperity, the available space for conversion can be depleted and new constructions become the most important supplier of new housing, offices, warehouses, etc.. A crisis in the office sector on the other hand can certainly help forward the process off adaptive reuse. New office constructions that continued during the start of the crisis created an oversupply and created the ability to cheaply leave the old office buildings

for new ones. The old offices come under a considerable price pressure and makes a conversion to housing feasible.

New constructions therefore also play an important role in the process of reuse and moreover also have their advantages as not all buildings are up for a long life or are able to meet today's standards. Hence adaptive reuse is not a single solution for supplying cities' needs. Still, where possible adaptive reuse should be applied as it carries a vast array of positive influences on its environment. Hereby it is important to mention that the future still holds a lot of opportunities for adaptive reuse to continue in Brussels and Copenhagen. Especially the office sector will be an important supplier for housing in the coming decades.

7.2. New possible research questions

To better understand previously mentioned dynamics, further research on this topic is needed. During research it became clear there is little known about the interaction between the FIRE sector and the government for promoting reuse and other processes restructuring our cities.

Furthermore a more elaborated study on the awareness of the possibilities and importance of functional reuse for policy makers, architects, FIRE-sector and public will allow to better understand the dynamics of reuse. A lack of data on adaptive reuse was one of the main thresholds for this study, therefore I propose a study to improve gathering of the info on the building stock.

A last proposal would be to investigate which kind of instruments (information, subsidies, fiscal policies, spatial planning) are most effective in promoting adaptive reuse.

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10.Attachments

10.1. Interview questions

I. What are the reasons for reusing a building?

II. What are the most flexible buildings for reuse? And why?

A. Office buildings are being constructed for shorter lifecycles. Buildings constructed of durable materials have the possibility to live on and be reused, are there a lot of buildings in ... that cannot be reused because of the bad choice of materials?

B. What are the places with the highest potential for flexible reuse?

C. What is the potential flexibility of the city centre of Copenhagen/Brussels?

III. What is the most practiced reuse and why?

IV. What and who can promote the adaptive reuse of buildings? Subsidies, better spatial planning, ... organisations for awareness

V. What are good indicators to measure the reuse of buildings?

VI. What can severely limit the reuse of buildings (spatial planning limitations, building codes and structure)?

A. How can this problem be solved ?

VII. Is it an active policy of the government to reuse buildings? If yes, in which way does the government try to promote it?

A. Does it take any longer to get a building permit for a reuse than for a new construction?

B. Can the urban planning department react sufficiently on functional changes asked by developers. Is there too much detail in planing to have a spontaneous readjustment of the city?

C. Is it easy for a private person to change the spatial plan to its need (shop has to become bigger than regulation, one shop more than allowed) or office is exceeding the max allowed amount of floor space?

D. If you could change something in urban planning, what would you change?

VIII. Does long-lasting vacancy have an influence on the reuse of buildings?

IX. Do economical problems in a particular sector promote reuse to another function? In example Harbour activities and Office real estate.

X. Do you see any particular waves (periods) of reuse?

XI. What are the biggest hurdles that have to be taken during reuse and are there any extra costs attached to it?

XII. Is there a relaxation of spatial planning during last 10-20 years

XIII. Is the 20 procent flexibility in housing in Copenhagen meant for ground floor use flexibility or for building block flexibility

XIV. Why are spatial planners still using functionalism to control the structure of cities., as some area's are not allowed to have mixed uses?

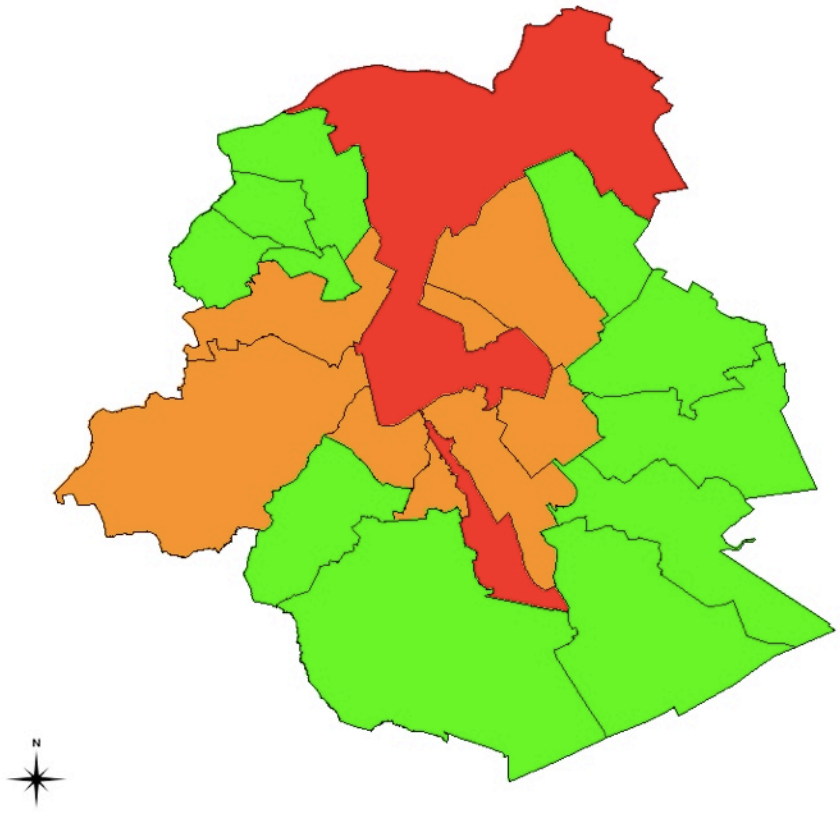
XV. Is it an active policy of the government to reuse buildings? If yes, in which way does the government try to promote it?

XVI. Do you see any particular waves (periods) of reuse?

XVII. How do you count mixed-function buildings?

XVIII. how do you querry potential candidates for conversions?

10.2. Three rings of municipalities used for Research (own)



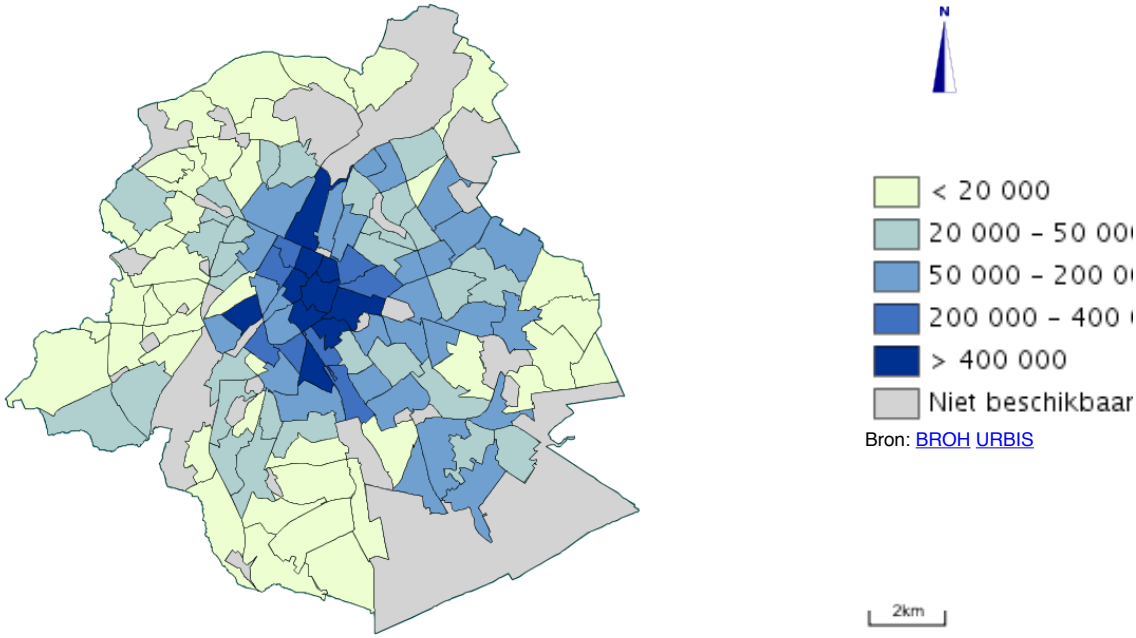
Municipality of Brussels

First ring (Anderlecht, Etterbeek, Elsene-Ixelles, Molenbeek, Sint/Saint-Gilles, Sint-Joost/Saint-Josse, Schaarbeek)

Second ring (Ukkel-Uccle, Watermaal-Bosvoorde, Sint-Pieters & Sint-Lambrechts Woluwe, Oudergem, Sint-Agath-Berchem, Ever, Vorst, Ganshoren, Jette, Koekelberg)

10.3. Concentration of offices in Brussels

Office density (sqm/ sqkm) (Source Ministerie van het Brussels Hoofdstedelijk Gewest, BISA - URBIS)



Ministerie van het Brussels Hoofdstedelijk Gewest © BISA - URBIS © ®

10.4. Office areas authorised for conversion by use category (1997-2008)

(Coekelberghs & De Beule, 2009 : 8)