BUILDING RESILIENCE IN URBAN SETTLEMENTS THROUGH CONVERSION ADAPTATION.

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ABSTRACT

The built environment contributes 40% to total global greenhouse gas emissions and 87% of the buildings we will have in 2050 are already built. If predicted climate changes are correct we need to adapt existing stock sustainably. Reuse is an inherently sustainable option, which reduces the amount of waste going to landfill. Inevitably settlements and areas undergo change, whereby land uses become obsolete and buildings vacant. At this stage, the options are either to demolish or to convert to another use. In central business districts (CBDs) outside of Australia there is a long history of office to residential conversion. Although these types of conversions are few in number in the Sydney and Melbourne CBD, a trend is emerging in conversion. Some 102,000m^2 of office space is earmarked for residential conversion in Sydney as demand for central residential property grows and low interest rates create good conditions. Coupled with this, is a stock of ageing offices and a population projected to increase by 4% to 2031 requiring 45000 new homes. With the Sydney market about to be flooded with the Barangaroo office supply in 2017, the conditions for residential conversion are better than ever.

However; *what is the level of sustainability in these projects?* This paper investigates the nature and extent of the phenomena in Sydney, as well as the political, economic, social, environmental and technological drivers and barriers to successful conversion. Through international comparisons with cases in the Netherlands, the paper identifies the key lessons. To date no major study has been conducted into the Sydney market nor into conversion adaptation. Furthermore most residential development has comprised new construction. There is substantial potential to change the nature of the CBD with residential conversion of office space and this paper explores this potential.

Keywords: governance, mandatory, voluntary, built environment resilience, hybrid instruments.

INTRODUCTION

The built environment contributes 40% to total global greenhouse gas (GHG) emissions and to achieve international agreed aims of sustainable development, building related GHG emissions must be reduced (UNEP, 2009). Construction of new, sustainable buildings is most commonly perceived as the best way of achieving these aims. However, 87% of the buildings we will need in 2050 are already built (Kelly, 2008). Reuse is an inherently sustainable option, which reduces the amount of waste going to landfill. Inevitably settlements and areas undergo change, whereby

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land uses become obsolete and buildings vacant. In some regions obsolescence and vacancy is caused by demographic and economic decline, whereas other regions experience a spatial shift, with change of land use as a result. At this stage, the options are either to demolish or to convert to another use. In central business districts (CBDs) or city centres outside of Australia there is a long history of office to residential conversion. In the Sydney CBD, few residential conversions have taken place, however, as the demand for housing close to employment grows (City of Sydney, 2010), and with an imminent production of supply in Sydney, the functioning of office markets is facing change. To cope with these emerging changes trends, lessons can be learned from international development. This paper investigates the drivers and barriers of residential conversion. Henceforth, the nature and extent of residential conversion in Sydney is investigated and finally the potential for residential conversion in the Sydney CBD is explored.

DRIVERS FOR CONVERSION ADAPTATION

Conversion is defined as a change of use adaptation and is a form of adaptive reuse that usually requires major changes of the building. Conversion as such contributes to the continued use of beloved historical cities and buildings, an example is the canal-houses in Amsterdam, originally constructed in the 17th century. In the course of 400 years, the uses of the buildings have changed numerous times, from warehouse to housing to offices and back to housing and shops, inflicting also changes to the buildings (Leupen, 2006; Remøy, 2010). Several authors (Barlow & Gann, 1993; Beauregard, 2005; Bullen & Love, 2010; Coupland & Marsh, 1998; Heath, 2001; Langston, Wong, Hui, & Shen, 2008; Tiesdell et al, 1996; Wilkinson et al, 2009), describe similar conversions of vacant office buildings in obsolete urban areas or downtown locations.

Heath (2001) describes office to residential conversions as a successful strategy for inner city redevelopment in London and Toronto. During the 1990s, the Toronto city core was a mono-functional office district, which was depopulated after six o'clock in the evening. Office construction booms in the late-1980s and an economic recession in the early 1990s resulted in high vacancy rates, rent reductions and tenants moving to newer accommodation with comparable rents (J. Barlow & Gann, 1995). Whereas the London planning authority was supportive though not proactive: conversions were mainly market led, the Toronto municipality introduced a planning policy to stimulate redevelopments. In Toronto, conversion and redevelopment contributed to adding 9000 dwellings to the downtown in the 1990s. By 2000 the office vacancy had fallen back to acceptable rates and the buildings most suitable for residential use had been converted. Drivers for conversions in Toronto and London included demographics and household compositions with changing attitudes and housing demand, and increased popularity of city-centre living. In addition, new use was needed to activate obsolete offices. A third and most important driver was the rent-gap between offices and housing: in some situations the return on housing was estimated to be 90% higher than for commercial property (James Barlow & Gann, 1993).

Between 1992 and 1995 the New York Downtown vacancy rate was 20%, caused by economic downturn (J. Barlow & Gann, 1995). Reacting to this development, the New York City government initiated the Lower Manhattan Revitalisation Plan to enable and subsidise residential conversion (Beauregard, 2005). Subsidies were given for conversion of office buildings constructed before 1975. The government encouraged conversions into studios and small apartments, targeting first-time renters. The low rents made the apartments popular for other

groups as well, although the area lacked basic services and facilities. The most important drivers for conversions were the tight housing market, a high supply of obsolete office buildings, and governmental policy. From 1995 to 2005 more than 60 office buildings were converted, and the number of inhabitants in the area grew.
In Tokyo, the office market collapse in 2002-2003, oversupply and economic decline were the drivers for conversion. Older offices in secondary locations became obsolete and were converted (Ogawa et al., 2007). As tenancy perspectives for new, large office buildings were still good, redevelopment was generally a more interesting option than conversion. The local government had little control over the urban developments, though recent focus on urban conservation might enhance conversion potential in the future (Minami, 2007).

The main driver for building adaptation in Hong Kong is sustainability. New construction contributes only 2% per year to the building stock, so it would take up to 100 years for new energy efficient construction to reduce energy use and GHG emissions according to the targets of the Hong Kong government. Hence, adaptive reuse is needed to reach the goals (Langston et al., 2008). Also in Australia although sustainability is a key driver for building adaptation, economic considerations are also very important. Upgrading the existing building stock to improve sustainability and reduce CO_2 emissions before 2020 is a target for the City of Melbourne (Wilkinson & Remøy, 2011). The aim is shared by Perth in Western Australia, where high office vacancy and increased residential construction activity has been another driver for building conversion in the last decade (Bullen, 2007). The governing authorities in many Australian cities seek to encourage sustainability in adaptations to deliver emission reduction targets.

In the described cases, sustainability aims, urban policy, office obsolescence and a tight housing market were the most important conversion drivers. These relate to political, economic, social, technological, legal and environmental drivers. Political, economic and social drivers consider residential conversion as a strategy to introduce housing in central business districts that have historically been mono-functional office locations. Moreover, residential conversion in central urban areas is seen as a possibility for realising affordable housing in city centres. In large cities, affordability of housing in central areas has become problematic for lower income groups especially and for the middle classes also. Technological and economic drivers are most important in cities where the value of residential property is higher than the value of offices. Due to technological and economic changes, and quantitative and qualitative mismatches in demand and supply, several cities have struggled with high office vacancy and obsolete office locations. Here, residential conversion is driven by market forces; conversion is less expensive and faster than demolition and new-build, and existing obsolete office buildings occupy central locations. Changes in building acts or legislation can lead to legal obsolescence and is another driver for converting offices into new use. Changes in floor heights and fire escape demand, and increased Energy Performance Certificate (EPC) norms are examples that lead to legal obsolescence. Within use adaptation is a possibility, but conversion for new use is often chosen, especially in locations with a high market demand for housing. Finally, environmental drivers are increasingly important. Office users demand sustainable offices, and older property is left vacant and obsolete. Major adaptation or conversion is needed to accommodate new use.

BARRIERS FOR CONVERSION ADAPTATION

The barriers are categorised as political, economic, environmental, social, technological/physical and legal. One of the obstacles for conversions is the specialised nature of the work and the competence of the actors in the real estate market. Developers, and investors works within their own expertise, and have little understanding of related disciplines (Remøy & Van der Voordt, 2007b). Moreover, the market is sectorial; office investors do not invest in housing and vice averse, and moving from the office to the housing sector is therefore difficult. Socially the infrastructure to support residential land use may not exist in a former or predominantly commercial area (Heath, 2001).

Legislation in the form of zoning plans and building laws are important conversion barriers. In most countries the building laws for offices are stricter than for housing, especially for fire escape, daylight admittance and energy efficiency (Remøy & Van der Voordt, 2007b). Regulations can require structural alterations that lead to high costs or make conversion physically unfeasible (Bullen, 2007). In existing buildings deleterious materials, such as asbestos, is a barrier where removal follows strict safety-rules as well as incurring high costs (Remøy & Van der Voordt, 2007a).

The original construction drawings of older office buildings are not always correct, though this is not a technical barrier as such, it makes thorough inspection of the structure necessary (Remøy & Van der Voordt, 2007a). The main structure or fabric of older buildings may be aged and experiencing decay, for instance the concrete may be deteriorating or spalling. Repairs can be costly, and secondary construction may be required. Physically apartments require more vertical shafts for electricity, water and plumbing services than offices (Remøy & Van der Voordt, 2007a). In newer European construction in Europe, pre-stressed concrete is commonly used, which loses strength when the steel is cut and making holes for services shafts is problematic (Remøy & Van der Voordt, 2007a). Overall most barriers are technical and threaten the economic performance of the building and the financial feasibility of the project.

RESEARCH QUESTION, AIMS AND OBJECTIVES

Former studies show the potential of conversion adaptation to enhance social sustainability in urban areas blighted by vacancy by introducing new functions (Heath, 2001; Koppels, Remøy, & El Messlaki, 2011). This paper explores the nature and extent of conversion in Sydney, as well as the political, economic, social, environmental and technological drivers and barriers to successful conversion. This research aims to answer two questions; *(i); what are the most important drivers and barriers for conversion adaptation in Sydney? And (ii); how can these be influenced to increase the conversion potential?* Through international comparisons with cases in the Netherlands, the paper identifies the key lessons for conversion adaptations. To date no major study has been conducted into the Sydney market nor into conversion adaptation in Sydney. Furthermore most residential development has comprised new construction. Drawing lessons from international examples, there is substantial potential to change the nature of the CBD with residential conversion of office space and this paper explores this potential.

RESEARCH METHOD

The research is qualitative, sharing the three basic assumptions identified by Patton (2002) of being naturalistic, holistic and inductive. Naturalism involves seeing the phenomenon in its

natural occurring state, in this case by visiting the countries to interview practitioners and visit sites to observe what has taken place. The holistic aspect involves looking at the whole problem to develop a more complete understanding of the influencing factors and variables which determine what the most important drivers and barriers for conversion adaptation in Sydney are and, to how these can be influenced to increase conversion potential. The inductive approach is derived from the literature review whereby a picture of the problems and issues emerge as the researchers become more familiar with the topic area. The literature review identified which areas needed to be addressed and enabled the researchers to compare whether practice and theory followed closely.

To further research the drivers and barriers, opportunities and risks of office to residential conversion, two illustrative case studies were conducted in the Netherlands and in Australia. An advantage of case study is that it is a flexible method, which can be adapted during the research (Robson, 2011. A limitation of the technique is that the researcher does not sample widely enough and that studies may represent the peripheries and not the average (Robson, 2011). However Yin (1989) noted that case study is concerned with analytical, and not statistical, generalisation. Care was taken to ensure conclusions drawn are noted as being analytically general rather than statistically representative. The criticism of case study as a 'soft option' was rejected as the method required preparation, knowledge of procedures (in this case conversion adaptation of commercial buildings) and analytical skills (Robson 2011). It is soft in the sense that no hard and fast rules exist for the researcher to follow. Bias, a question raised about case study (Robson, 2011) was eliminated because the researchers had no personal nor professional contact with any of the interviewees, companies or practices involved.

Similar case study protocols were used to conduct both cases, focusing on the different drivers and barriers for conversion. The Dutch case in this research is an example of conversion from office to housing. The case study was conducted ex-post by a site visit, interviews with stakeholders and studying drawings and documents. By combining the information from the different media, the characteristics that have an effect on the residential conversion potential were revealed and compared to literature. The Australian case at this point in time comprises a desktop study of publicly available information. By comparing the Dutch and the Australian case, similarities and differences were sought and the relationship with drivers and barriers were analysed.

Data was collected via semi-structured interviews as it allowed the researchers to collect identical data from each interviewee, in a reasonably relaxed atmosphere (Moser and Kalton, 1979. Bell, 1995). A formal structured interview was too restrictive and would not allow the interviewers to investigate interesting areas, which arose during the interview. The unstructured interview was rejected as they can generate data, which does not relate to other cases and is impossible to analyse (Robson, 2011). The interviewers started with factual questions to put interviewees at ease. The interviewer decided to note down answers rather than record using a printed question sheet with space for answers to be noted down during the interview without too much loss of continuity. The use of a recorder can inhibit some interviewees from frank answers. The questions became increasingly complex as the interview progressed and finished with some questions, which allowed the interviewee to express personal ideas to generate 'richer' deeper information (Moser and Kalton, 1979). Each interview was took an hour, the optimum time for useful data collection without over tiring participants. Following Moser and Kalton (1979) long

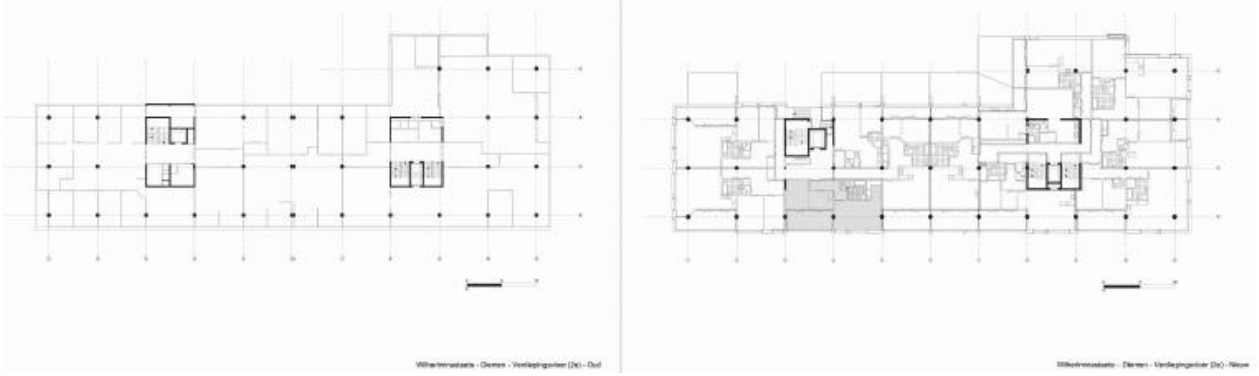
multiple confusing questions were avoided and jargon was eliminated because of the international aspect of the study. There were no leading or biased questions in the interview and the interviewers expressed no views during the interviews to lead or encourage interviewees in any way.

CASE STUDIES WILHELMINASTAETE IN AMSTERDAM

The original Wilhelminastaete building, completed in 1969, was occupied. In 2001, the bank moved, and the building was left vacant. The building was not attractive for new tenants, and remained vacant for 6 years before the owner intervened. The building is located in Diemen, on the outskirts of Amsterdam. The location is accessible by car, near the railway and underground station and well connected by public transport to the centre of Amsterdam. The level of facilities for residents and workers amenities is good. The building is 6700 m ^{2}. It is a typical building from the 1960s, with a concrete column and beam construction and a curtain wall facade clad with sheet stone.

Plate 1 – Wilhelminastaete pre and post conversion

Figure 1 Floor plans pre and post conversion



The most important drivers for this conversion were the high vacancy of offices, and the high demand of housing. The former bank office was technically and functionally outdated. When the bank left the building, there was no new tenant, and it was left vacant and regarded as obsolete. The location was no longer considered suitable for offices. Moreover, the technical state and the building's image would require a thorough renovation to comply with current demands. The owner considered several options for reuse and demolition and new construction. The feasibility study of residential conversion for senior citizens was seen as an opportunity because of the high demand for housing within this group. The location is accessible, as it is located near to a train station and has good social facilities within walking distance. The building did not have a good image, and demolition was an option. The municipality supported the residential conversion plans. This was an important success factor for the conversion, as the zoning plan had to be changed to allow housing. The building was converted into 43 apartments ranging from 60 to 190 square metres.

The most important physical characteristic that contributed to the feasibility of conversion was the structure and spacing of the columns (7.2 x 7.2 metres). As the building had sufficient load bearing capacity an additional storey could be added and penthouses were provided. Moreover, the facades were not load bearing and could be adapted. Due to the technical condition of the façade, where the stone panels were detaching, the façade was replaced. The new facade was designed as a typical housing facade, vertically laid out instead of horizontal (see plate 1). In addition existing lifts could be reused. The area needed for hallways and corridors could be minimised as the lifts and stairways were well located (see figure 1). The existing stairways were reused and provide escape-routes. No additional staircases were needed. There were no major barriers for this project. Together with the architect, the building owner developed a functional programme that would fit the building and the intended target group. This meant that the building was equipped with spacious entrances to fit wheelchairs and mobility scooters. On the ground floor, a small bank and a library were provided. The remaining area of the ground floor and the first floor were designated to parking and storage space for residents.

CASE STUDY - 80 ALFRED STREET, MILSONS POINT, SYDNEY, NSW.

The office building comprised 14 floors originally and was constructed in the 1970s. Owned by Bridgehill Milsons Point Pty Ltd., 80 Alfred Street represents a complex conversion of a 14 storey commercial building to an 18 storey scheme and is part of the transformation of Milsons Point area from a commercial office location predominantly into a mixed use precinct. 80 Alfred St has an elevated position on a sloping site on the Milsons Point peninsula; which is well-located for the North Sydney office area and transport links to the CBD and elsewhere (see figure 2). Importantly, there are views of Lavender Bay, Sydney Harbour, the Opera House, the CBD skyline and beyond which is marketed as a major attraction. The new development is mixed use, comprising retail and commercial uses, 129 units and basement parking. Of the apartments, there are 16 studios, 45 x 1 bed units, 62 x 2 bed units, 6 x 3 bed units including 12 adaptable units. Parking is provided for 59 cars, 10 motorcycles, and 90 bicycle racks, and there is a communal open space on the rooftop. The amount of car spaces and provision of 2 car share spaces indicates the building will perform fairly well in respect of transport related greenhouse gas emissions.

Figure 2 location of 80 Alfred St,

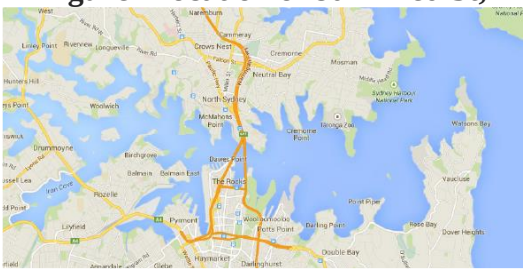
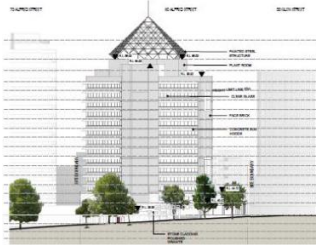


Plate 2 Impression of completed units

Plate 3 Existing Building



Office vacancy rates increased in Sydney from 7.2% in 2013 to 9% on March 2014 with further increases predicted, and high residential property values. CBRE's David Milton, Director for Residential stated 'the best use for out-dated office buildings is conversion to apartments' (Saminather, 2014). Low interest rates have attracted overseas buyers as well as domestic investors into the housing market and this has inflated prices by almost 10% in 2013. This was coupled with a dampening in office demand as unemployment rates reached a 10-year record high at 6% (Saminather, 2014). A recent trend, according to CBRE, is an increasing desire for city centre living, which have better restaurants, bars and entertainment infrastructure (Milton, in Saminather, 2014). The risk with conversion is the time taken to convert from office to residential use, some 4 years from application to end of construction (Milton, in Saminather, 2014). Markets can change during this time, and most developers' pre sell a proportion of apartments to mitigate this risk, although at times potential investors will walk away from deposits if they consider greater losses will be incurred in a continuing interest in that property.

80 Alfred Street is located on the North Shore business district, which is perceived as less desirable than it was previously for office land use. The location has good road and public transport links nearby. Importantly the conversion was able to accommodate car parking spaces for residents. The costs of upgrading the building were another factor, and were considered prohibitively costly compared to conversion adaptation. In addition the local authority supported the conversion of the office to residential land use, which was important. With regards to planning, the main concerns focused on views, overshadowing, privacy, building separation, parking, noise, and amenity and construction impacts. Some minor amendments to the current plan were accepted for example, the maximum height of the building. The building also meets Building Code standards in respect of energy and other sustainability measures,

COMPARISON

Where drivers are concerned the similarities were both projects were mixed use development, and high vacancy rates and prevailing market conditions encouraged conversion. The design and appearance of both buildings was outdated and both had an accessible location. Both projects involved some amendments to planning requirements. Finally both buildings had floor plans

suited to apartment layouts. Whilst sustainability is not being marketed as a primary feature of either conversion, there is considerable benefit of retaining the embodied energy in the existing structure. Both projects are compliant with planning and building regulations, which have some sustainability criteria with regards to energy and water. Conversion adaptation is not being promoted heavily or incentivised by the authorities in Sydney. Transport emissions are likely to be lower as not all apartments have parking spaces.

CONCLUSIONS

This paper has shown that conversion adaptation practice is more embedded within the Dutch market than the Sydney market currently and that there is much to be learned from experiences in the Dutch market. However the conclusions drawn here are noted as being analytically general, rather than statistically representative as they are based on two illustrative case studies. In answer to the first research question, the key drivers for both conversions are economic, although some social and environmental benefits are realised coincidently. In terms of research question two and how these drivers can be influenced, to date the authorities in Sydney are not realising as much sustainability in conversion adaptations as could be achieved, however it is an immature market at present and may change over time. Furthermore the housing market does not put great value on sustainability in the home buying decision, and thus developers have little need to market sustainability attributes to attract buyers. Inherently converting existing buildings allows considerably retention of embodied energy, other environmental benefits come with locations which have good access to public transport and local amenities. The next stage of the research is to collect data on the adaptation from key stakeholders and actors to ascertain a deeper understanding of the sustainability and conversion adaptation in this market.

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