

URBAN “BROWNFIELDS”: AN AUSTRALIAN PERSPECTIVE

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ABSTRACT

Treatment and conversion of former industrial sites into residential or commercial properties are becoming popular practice in the intensification process of urban regeneration in mature and emerging markets. We use Melbourne as an example to obtain an overview of the institutions that govern inner-city brownfields in Australia. We identify projects/sites, transforming processes and stakeholders related to Melbourne’s inner-city brownfields, an example of ‘best practice system’ useful for international knowledge exchange. The paper concludes that fundamental to the strength of Australian brownfields development is the mature institutional setting for property development. With comprehensive legal system, the government and its agencies are playing essential roles for socially responsible redevelopment process where negative externality due to previous industrial land use is properly identified and responsibilities clarified and allocated. It is hoped that the study can help stimulate and facilitate knowledge sharing between Australia and China on brownfield redevelopment. However it appears that it is challenging task for direct comparison and knowledge transference which demand further scrutiny by policy maker and researcher.

Keywords: brownfield, regeneration, regulatory framework, stakeholder

INTRODUCTION

The rise and decline of cities and their constituents share similarity with the rise and decline of nations, societies or even civilisations. Thus it is immensely useful to understand these ‘cycles’ in terms of their adaptive capacity, their revitalisation process, and associated government intervention. Treatment and conversion of former industrial sites into residential or commercial use is now popular practice in the intensification process of urban regeneration in mature and emerging markets. About 60% urban housing in the UK is now built on brownfield sites. It is similarly extensive in European Union members, the United States and more recently in large Chinese cities. The reuse of former industrial land can have substantial impact on the shaping/reshaping of cities and the quality of life of local residents. The demand for inner-city land has triggered a refocusing of the building industry which has impacted government welfare policies (Syms, 1997, Adams and Watkins, 2002). In China, this has become an urgent matter due to its direct and strong impact on city governance, property supply, infrastructure, social welfare. All are critical to the sustainable growth of an economy. Chinese cities are rapidly transforming themselves. Little is known about the nature of its state-led or property-led regeneration process. Equally unaware is the longer term social and environmental impact. At the core of the brownfields debate is an urgent need of a coherent framework to treat main urban processes, namely obsolescence, intensification and the need for sustainable redevelopment. Existing brownfield cases and experience are critical the forming of such framework.

This paper is not intended for environmental policy design – it is an early-stage inquiry aims to form an overall opinion of inner-city brownfield transformation experience in a city with mature economic base. Insights from Melbourne’s experience will lead to an ongoing study of urban brownfield regeneration. (Wu and Chen, 2009) The authors hope to facilitate knowledge exchange across jurisdictions. For example the regulatory framework in Melbourne may be seen as a ‘best-practice’ system ‘transferable’ to other regions and nations. We do not intend to rush into any conclusion (or presumption) such as that the governing framework that is developed and evolved in Australia is a suitable model for China where heavy industry used to be located at inner-city and recently being pushed away by strong housing demand. The applicability of one system to another social/geographical content is question requiring extensive study.

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THEORY AND CONCEPT

Brownfields in Context

Different versions of brownfield concepts exist. Most have similar elements. Alker et al. (2000) proposed a definition from a multi-disciplinary perspective, stating that a brownfield site is “*any land or premises which has previously been used or developed and is not currently fully in use, although it may be partially occupied or utilized. It may also be vacant, derelict or contaminated.*” Dixon (2006, 2007) describes brownfield as “*any land, which has been previously developed, including derelict and vacant land, which may or may not be contaminated*”. Some follow government view of previously developed land as defined by the Department of Environment, Transport and Regions (DETR) in the UK (Adams and Watkins, 2002, Syms, 2004). In the US the Hazardous Substance Research Centre (HSRC) defines the term as *abandoned or underused industrial and commercial facilities available for re-use*. It suggests that the expansion or redevelopment of such a facility may be complicated by real or perceived environmental contaminations (HSRC, 2006). Similarly the US Environmental Protection Agency (EPA) defines the term as “*real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.*” As Armstrong (2007) noted, the concept of *brownfield* involves the interplay of various actors and agents over each city’s history – a process of social construction. Within this context the needs for confining existing definitions to help understand key forces driving urban brownfield redevelopment are explored.

The importance of brownfields and its scale have been subjected to continuous research and policy debates. (Dixon & Adams 2008) It has become clear in recent years that cities in former centrally controlled planned economies (e.g. China) have started intensifying inner-city property/infrastructure development, converting former industrial areas into high-density housing stock. (Xie & Li, 2010, Wu & Chen 2010a) For the purpose of this study, brownfield is studied from a perspective of “*inner-city sites with industry heritage e.g. contamination or other environmental problem which have been or are being rapidly developed or transformed into higher-density residential or commercial uses*”.

Brownfields in Australia may be considered “*urban sites which were large parcels of land, owned by a single party, usually government or an industry, currently unoccupied and depending on previous use, contaminated to some extent*” (Newton, 2010). Many brownfields in Australian cities such as the Docklands and Federation Square in Melbourne, the Darling Harbour in Sydney, the Newport Quays in Port Adelaide and the Southbank in Brisbane have been targeted for redevelopment being part of the urban intensification process. It seems a pattern of inner-city redevelopment is being formed in different regions and cities around the world. Much less understood are their nature, drivers and impacts. To facilitate meaningful and useful research for theory and policy developments, the following aspects are important when conducting comparison of cases in different jurisdictions and/or geographical locations.

- The specific brownfield concept in a city regeneration context;
- The historical background of brownfields cases being studied;
- The different socio-economic settings of brownfields at different time (historical periods);
- The direct and indirect measures of brownfields impact on cities and societies;
- The evidence of land use pattern change over time;
- The welfare and resource allocation concerns regarding the brownfield redevelopment process.

The basis of the above is an understanding of brownfield sites in the context of city regeneration or revitalisation. This paper aims to build the context of brownfields in Melbourne as physical stock and as interacting groups and institutions.

Brownfields and Sustainability

Using city and its functional ‘area’ (e.g. district) as the unit of analysis, it is clear that each city has a unique path which consists with the pattern of its physical (form) and social (institutions) structures. This unique contextual system affects the adaptation of technology and the governing practices for brownfield regeneration. The economic transition that is taking place in China from a centrally planned economy to a market driven economy has evidenced large former industrial sites rapidly turning into high-density residential or commercial space. As emerging market seem not to have comprehensive institutions to guide practices in the rapidly expanding property industry, there is the welfare concern of potential impact on the occupier who uses or the owner who receives income from contaminated sites. (Cao & Guang, 2007, Wu and Chen, 2010a, Wu and Chen, 2010b) Hence the social welfare issue underpins a sustainability concern.

Brownfield sites convert into other land use(s) usually implies the demise of their original land use functions and spatial characteristics. Process to revive a degraded area requires active markets of land use together with a system of suitable institutions. The importance and sensitivity of the new institution have been noted by Arrow et al. (1995), which are considered effective ways to provide environmental legislation and market incentives to reduce negative environmental impact. In fact the nature of brownfields is negative externality imposing costs over time to different stakeholders or interest groups. However Arrow et al. (1995) also point out that standard policies often undermine cross-nation and intergenerational costs – both are key components of the concept of sustainability and sustainable development. This implies limitation of standard cost-benefit analysis (CBA), hence the demand for a more opened and holistic approach. This study intends to conduct its observation in line with this approach.

METHOD AND DATA

Case study approach is used in this study. Melbourne's brownfield sector is treated as a case with key components, namely regulatory framework, history, market stakeholder and land cases, are subject to examination, aiming to form an overview of the sector. To date, information has been gathered on the regulatory framework, potential stakeholders and major project cases. To confirm the regulatory framework that is in place, it is intended that dialogues (e.g. interviews) take place with stakeholders on a range of cases in Melbourne where industrial sites are redeveloped into commercial or medium/high density residential. These cases are expected to provide empirical evidence of the regulatory framework. Potential stakeholders will be identified with brief summary of their involvement. Case projects are identified with brief summary of background of the sites and characteristics. Data are collected from publically available sources.

First we conducted preliminary interviews and desk study to facilitate background setting and data selection. We then analyse ABS and government report to help understand industrial history, heritage and the city's spatial changes. In particular we are interested in (a) Melbourne industry base over time, and (b) Melbourne inner-city land use over time – land use type and density change. An analysis of formal rules and procedures is then conducted leading to a regulatory framework of brownfield redevelopment in Melbourne. The remaining parts identify, select and analyse suitable cases (sites/areas) in Melbourne using the EPA database of brownfields, as well as the identifying of stakeholders, grouping and market structure analysis. This helps accumulate empirical facts, an inductive approach toward generalisation.

Data collection consists of publically available information. The information required for the analysis of the regulatory framework, identification of stakeholders and of potential case is available from a number of sources, mainly accessible via internet. The regulatory framework basing on processes of changing land use is explained on government websites and publications usually available on these websites. One of the detailed is the Environmental Protection Authority (EPA). The EPA is the main body that governs the environmental audit system and therefore has numerous publications regarding the management of contaminated land and information for stakeholders, including developers and planners.

We identify case projects/sites and stakeholders (market and government) through literature search, interview, and web search as well as through database or information sheets available through government (e.g. EPA) websites. The EPA has a register of all the statement and certificates of audits with reference numbers that provide access to the reports that were produced for the sites in question. These reports while not available through the website are publically available through the EPA library located in Carlton, Melbourne. Information available through the EPA library includes any environmental audits that have taken place in relation to a particular site including the statement or certificate of environmental audit. The Environmental Audit also contains historical element of the site. In addition, for high profile projects where major issues have been encountered, the EPA has released Community Information sheets, which are available through its website e.g., the Barkly Street project. As this development has made its way into the court system, the legal transcripts are available through the Austlii database (<http://www.austlii.edu.au>).

Large-high profile developments such as the Docklands or the Marybyrnong Defence Site have information regarding project background and current developments status through the VicUrban website (www.vicurban.com) as well as through websites of local council, e.g. the Amcor redevelopment case (<http://www.yarracity.vic.gov.au/Planning--Building/Major-developments/Amcor-Site-Alphington/>). Several informal visits were conducted to facilitate collecting and validating data. The next stage of this research will require more specific information of each case to empirical evidence of the process of urban brownfield generation. This will most likely take place through a series of focused semi-structure interviews or focus groups with multiple stakeholders involved in the development.

THE REGULATORY FRAMEWORK

To understand the institutional settings for the development of a Brownfield site, a chart was developed showing the regulatory relationship (see Figure 1). If a former industrial site is to be converted into residential or a commercial use there is a strict pathway through the regulatory framework that must be followed. This is to ensure that end users or the interest group are not negatively impacted by potential contaminations of the previous land use. Or at they are at least identified to enable proper compensation. It is important to note that the different states of Australia will have slightly different regulatory bodies due to the fact that each state has majority of the responsibility of planning, development and environmental protection.

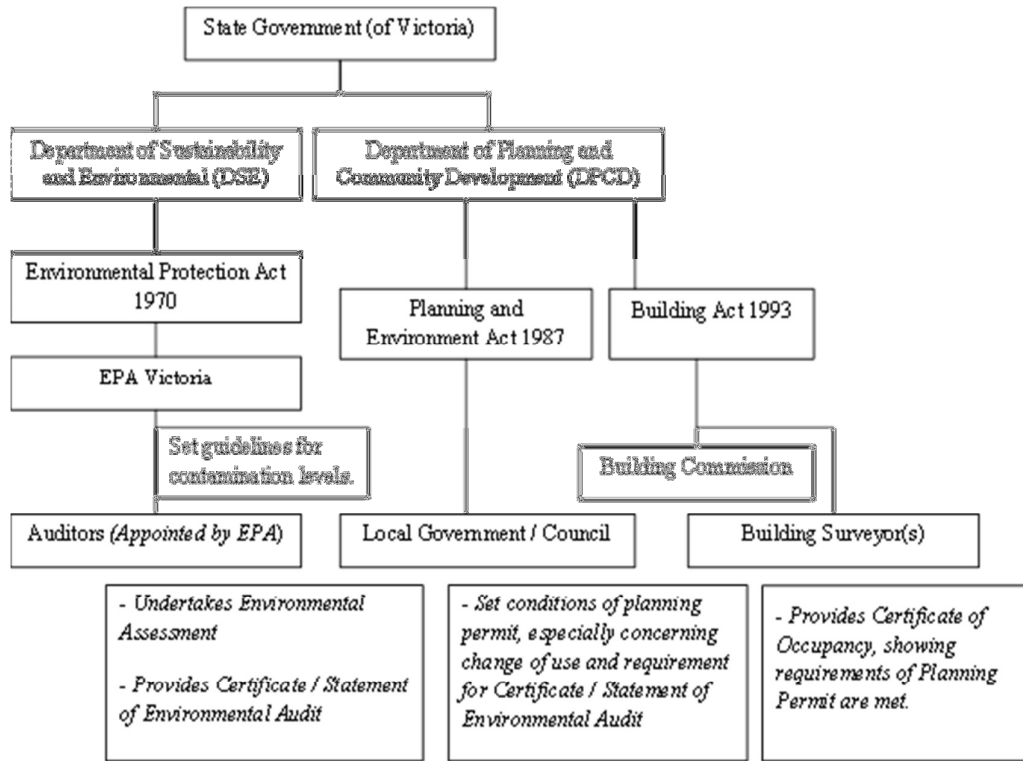
Our current understanding of the regulatory framework can be explained as follows: if an industrial-zoned site is targeted to be converted into residential or commercial, a change of zoning must take place. To change the zone of a parcel of land, this must be done through the relevant planning authority. In most cases this will be the local council (e.g. City of Melbourne, City of Yarra). To ensure that a former industrial use of the land will not negatively impact on end users, in particular with regards to potentially contaminated land, an environmental site assessment is carried out by qualified environmental engineer. The result of the environmental site assessment will be a decision of whether an environmental audit is necessary. We note the importance of professional ethics in the site assessment process because a decision by an environmental engineer may mean substantial cost or benefit to key stakeholders (e.g. developer).

The result of an environmental audit is either a statement or certificate of environmental audit stating either that the levels of contaminated are within levels appropriate for the proposed use or that there is no contamination of the land.

An environmental auditor who is accredited by the EPA must undertake the environmental audit. This process is guaranteed through the planning permit and building permit process. If an environmental audit is required, the statement or certificate of environmental audit is a condition of the planning permit and therefore the certificate of occupancy and the building permit. Prior to anyone occupying a new development, a certificate of occupancy must be obtained from a building surveyor. This certificate will only be given if certain conditions are met. One of them being that the required statement or certificate of environmental audit has been obtained. A building surveyor must be accredited & registered.

For the case of Victoria, this process is further described in the Environmental Potentially Contaminated Land General Practice Note. The Note is published by the Department of Sustainability and Environments (DSE) in conjunction with the EPA and the State of Victoria. The purpose is to provide guidance to stakeholders regarding the management of potentially contaminated land including how to identify contamination, the assessment required for planning permits, and explanation of the environmental audit process. This system in operation is costly to run – it increases the level of certainty, but is more costly for the development industry. This may play partial role for the increase of house prices.

Figure 1 Urban Brownfield Development Regulatory Framework (Victoria)



MELBOURNE INNER-CITY BROWNFIELD SITES

Melbourne's Industry and City

Although Melbourne has one of Australia's largest industrial bases (CBRE), it is clear that the cornerstone of the local economy has been service, agriculture and mining (e.g. WA & QLD) rather than manufactory or oil refinery industries. Therefore, finding cases that match the criteria of large industrial sites located at inner-city area was proven difficult. Many brownfield sites in urban locations are smaller size typically used by light manufacturing from the 1950s such as motor vehicles, metal processing, textiles, clothing and footwear and chemicals. If goes back further in history, a brief survey shows that Melbourne used to be one of the centres for mining (i.e. the gold rush) and at present finance and services. None will provide an incentive to trigger heavy industrial land use at inner-city location. Recent city history shows an increasing level of off-shore production and trade, which further reduce the significance of the city's industry base. It may be said that the case of brownfields and their redevelopment in Melbourne, and perhaps partially Australia, is relatively insignificant compared to major industrial nations such as the UK, the US, Japan, Germany and China.

Inner City Brownfields

Detailed study of existing cases is to provide examples of how the change from a brownfield site to residential site is made. The details from the case studies will provide empirical evidence of the process. Ideally, a project with positive, successful story of brownfield regeneration experience is useful to facilitate the knowledge sharing with less advanced countries and regions. The major sites and projects in Melbourne have been identified and they are grouped by project

nature (e.g. density), location, purpose, level of environmental impact, scale/length of project. These projects are at various stages of their development processes. The most significant may be the Docklands which is one that is halfway through its development goal. It is functioning at its transformed state as an integrated community of residents, workers, investors and visitors (VicUrban, 2011). The following cases are current projects that provide an overview of the process of inner-city brownfield regeneration in Melbourne. The difficulty with this development is the number of individual sites that make up the whole district. As there is no one site in the Australian setting that is comparable to those found in high-density cities such as Hong Kong, a number of cases will be required to illustrate all areas of urban brownfield regeneration.

- Melbourne Docklands
- Melbourne Southbank precinct
- Former Power Station Site, Lonsdale/Spencer Streets
- Former Maribyrnong Defence Site
- Amcor Site, Alphington
- Fisherman's Bend.

Melbourne Docklands

The Docklands was home to Melbourne's first industries during the second half of the 19th century and grew to become a prominent industrial and transport hub by the turn of the century. Up until the 1970s, the area was Melbourne's key port. In 1991, the Docklands Authority was established to facilitate private sector development of the area. In 1996 the site was released to the market in seven separate precincts with first project being the construction of Docklands Stadium that commenced in 1997. The area has been developed in partnership between the government and the private sector (land is state-owned) and the developers are private firms such as MAB, Lend Lease and Mirvac. The Docklands redevelopment has been one of Australia's largest urban renewal projects with a value of \$12 billion development covering an area of 200 hectares of land and water. At completion the area is expected to provide housing for 17,000 people, workplaces for 40,000 and a tourist destination for approximately 20 million people per year (VicUrban, 2011). The Docklands case is large-scale, longer-term, mix-use project with less significant industrial heritage, located at central city. It is likely that the Docklands is a case that is comparable to some cities in China.

Melbourne Southbank precinct

Melbourne's Southbank precinct was formerly an industrial area located south of the inner-city area. Its transformation into high-density apartment and office area began in the early 1990s being part of an urban renewal process. Although with former industrial use, most areas were light industrial, warehousing and wharves. Denton corker Marshall was responsible for the original precinct design in the early 1990s. The level of high-rise redevelopments shows Southbank precinct could be valuable to the study of Melbourne's inner-city high-density brownfields redevelopment.

Power Station site

The former Power Station site situation on the corner of Lonsdale and Spencer Street in the Melbourne CBD is also referred to as West Melbourne Power Station, Spencer Street Power Station or Lonsdale Street Power Station. The site commenced operations in 1894 as the Melbourne City Council Power Station to operate public lighting. It continued to expand up until the 1950s, and eventually ceased operations in 1982. Demolition and clean-up activities were commenced on the site in 2008. The site has been owned by a number of private developers and is currently owned by Far East Consortium. The task to obtain a statement or certificate of environmental audit was completed in July 2010 with a statement of environmental audit being issued. The site has planning approval for over 2500 apartments in a high rise, high-density project (Cooke, 2010). Construction on stage one commenced in late 2010 by the construction company Brookfield Multiplex. Power Station site is medium scale, medium term, central city high-density apartments with relatively significant industry heritage.

Maribyrnong Defence site

The Former Maribyrnong Defence Site is the location of a future urban infill development. The 128-hectare site was sold by the Federal Government to VicUrban in April 2009 (VicUrban, 2010). The history of the site includes a silcrete quarry, ammunitions factory including testing facilities, Maribyrnong racecourse and a racing stud farm. The project is in early stages, with Maribyrnong Shared Vision document being the output of the first phase of community consultation. From 2010 to 2014 the project is expected to start master planning and statutory planning. The whole project is expected to provide 3000 new dwelling and is expected to take between 10 and 15 years to reach completion. This is longer-term, large-scale, lower density residential siting away from city centre with less environment impact.

Amcor site

The Former Amcor site is a 15.6-hectare site that has been highlighted as a potential mixed-use development, following the announcement in 2008 that Amcor would be closing the plant and moving operations to NSW. It sits in Alphington. Both the local council and the Planning Minister at the time, Justin Madden have been active in promoting the potential development. In 2009, the Planning Minister announced that the site would be rezoned to Mixed Use (City of Yarra, 2009). The local council, the City of Yarra, has ensured the community is being kept informed regarding the development. As the site has still not been sold on, the time line for the development is still unknown. It is longer-term, large scale, but only with some relevance.

Fisherman's Bend site

Fisherman's Bend is a new development of 200 hectares of that is currently a light-industrial area of factories and vacant lots near the West Gate Bridge. The development will be on a similar scale to that of the Docklands with up to 10,000 to 15,000 dwellings to be built over a 20-30 year timeline. This development was announced in February 2011, and is therefore in the very early stages. It is longer term and large scale, but only of some relevance.

Barkly Street at Brunswick

This project is one that has been through the legal system over the last 5-10 years as a statement or certificate of audit was not presented when the certificate of occupancy was being sought. This resulted in the project being unable to be occupied, as contamination was still present on the site. Although the project was medium density (3 storeys) it is valuable to show how the system works when something goes wrong. It is medium term, smaller scales, located at fringe of central city, some relevance.

Stakeholders

The government sector

Department of Sustainability and Environment

The Department of Sustainability and Environment (DSE) is the government agency for sustainable management of water resources, climate change, bushfires, public land, forests and ecosystems (State of Victoria, 2011). DSE produced a General Practice Note on Potentially Contaminated Land that provides guidance for planners and applicants about how to identify if land is potentially contaminated, and how the planning system deals with potentially contaminated land (State of Victoria, Department of Sustainability and Environment, 2005). One of DSE service partners is the EPA. An explanation of the role of the EPA is included below.

Department of Planning and Community Development

The Department of Planning and Community Development (DPCD) provides statutory and strategic guidance about planning in Victoria (State Government of Victoria 2011). The DPCD works collaboratively with local government and other key public and private stakeholders to lead State and metropolitan development, strategic and statutory planning, development regulation, and environmental assessment.

Municipal Council (e.g. City of Melbourne)

The municipal council is the responsible authority for issuing planning permits and administering the planning scheme applicable under Planning and Environmental Act 1987 (State Government of Victoria, 2011).

Environmental Protection Authority (EPA)

The powers, duties and functions of the EPA are established in the *Environmental Protection Act 1970*, including the administration of the Act and any regulations and orders made pursuant to it (State of Victoria, 2011a). With regards to urban Brownfield regeneration, the EPA, through the Environmental Audit System provides assurance to stakeholders regarding the condition of a site and its suitability for use with the result of an audit being either a certificate or statement of audit that ensures that the site is suitable for the intended use. This is managed at the time that the change of land use occurs for example, from industrial to residential use and is linking with the planning system. This process is further explained in the State Environment Protection Policy (Prevention and Management of Contamination of Land) which identifies the links between the environmental audit system and the statutory planning system, ensuring sites that need to be audited are subject to audit, and that any conditions associated with the audit outcome are implemented. In addition to this, some sites present an unacceptable risk to human health or to the environment in their current use. Such sites are typically subject to clean up and/or management under EPA directions.

Work Safe

Work Safe Victoria is the government agency that administers the *Occupational Health and Safety Act 2004*. The responsibilities of WorkSafe include to enforce Victoria's occupation health and safety laws and the help avoid workplace injuries occurring (WorkSafe, nd). The process of urban brownfield regenerations has the potential of exposing workers to harmful substance on site. Under the *OH&S Act*, employers, including principal contractors, have general duties to provide a safe and healthy working environment for workers, any contractors that they hire and others living, working or passing nearby. WorkSafe Victoria, in conjunction with EPA Victoria have produced a document, *Industry Standard – Contaminated Construction Sites* which provides developers and principle building contractors in Victoria with a guide to safe work practices on contaminated construction sites (WorkSafe, 2005).

Government Agency / Non-private Organisation

VicUrban

VicUrban is the Victorian Government's land development agency with the broad function and responsibilities established in the Victorian Urban Development Authority Act 2003 (VicUrban Act). The major projects that VicUrban have been involved in include the Melbourne Docklands and the upcoming Maribyrnong Defence Site. Through the Victorian Urban Development Authority Act (*VicUrban Act*), VicUrban has responsibility to carry out urban development, develop the Docklands area, undertake declared projects and assist in the implementation of Government urban development policies and strategies, including Melbourne 2030 (VicUrban, 2011). VicUrban has been given a mandate to:

- Assemble, consolidate and prepare land in existing urban areas for higher density housing development.
- Encourage a diverse range of housing types, including smaller dwellings.
- Supply competitively priced lots to the housing construction industry.
- Work in partnership with housing providers to develop more inclusive residential estates.
- Encourage the delivery of affordable, accessible and sustainable high density housing.

The nature, role and behaviour of organisations such as VicUrban is itself a complex topic deserving a separate study.

Heritage Victoria and National Trust

The National Trust is a not-for-profit organisation which works closely with Heritage Victoria which is part of the State Government of Victorian. Some former industrial sites may have heritage value therefore listed under Heritage Victoria's *Victorian heritage Register*. The two organisations may have strong presence in brownfields redevelopment.

Private Market / Industry

Developer

Private developers may have slightly different roles depending on whether the project is a government driven one such as Docklands or Fisherman's Bend or whether the project is a privately driven one for example the Former Power Station Site. In general, the developer acts as the client in the project to facilitate the project by arranging financing and engaging the consultants and head contractor to undertake the construction works. In terms of urban brownfield regeneration, developers will attempt to mitigate their risk against contaminated land as these stakeholders are essentially profit driven. This may be done through due diligence process, and engaging appropriate consultants early in the project lifecycle or contracting the risk to the head contractor.

Builder

This group of stakeholders includes both head contractor, engaged by the client or developer as well as the subcontractors, engaged by the head contractor to carry out the works. For these stakeholders, it is paramount that they understand the risks involved with the development and how these are covered in the contracts. The risks of contaminated land may impact on programming, direct monetary costs of disposal, amount of testing required and occupational health and safety.

Occupier

End users are stakeholders that are protected through the regulatory framework by the relevant government agencies; however for many major projects developers may seek community engagement during the pre-construction phase. For major developments such as Docklands and the Maribyrnong Former Defence Site, VicUrban provide an opportunity for community members, which may include potential end users, to register their interest to be kept informed about the community consultation program. For high-rise residential, users represent individual households or investors.

Professional Services Sector

Environmental auditor

Some professional services are governed by law yet most are market-driven in the Melbourne brownfields sector. Environmental Auditors are appointed by the EPA under the Environmental Protection Act 1970. Their role is to undertake Environmental Audits as required through the Environmental Audit System. A list of appointed environmental auditors is accessible through the EPA website: <http://www.epa.vic.gov.au/envaudit/auditors.asp>

Building surveyor

The functions of a building surveyor are mandated by legislation in the Building Act 1993. The statutory functions of a building surveyor are to issue building permits, conduct mandatory inspections of buildings and building work and issue occupancy permits or certificate of final inspection. They are responsible for ensuring consistency with planning permits. The Australian Institute of Building Surveyors is the professional body that accredits building surveyors in Australia. It is the connection between the requirements of the planning permits and ensuring that these are fulfilled prior to issuing an occupancy permit is the main area a responsibility that building surveyors have when it comes to the management of changes of land use in the process of urban brownfield regeneration. Building Surveyors are employed as consultants in project to undertake these functions.

Environmental consultant

Environmental Consultants, while not necessarily environmental auditors are able to undertake environmental site assessments on a site to determine whether an audit is appropriate. This is described in the General Practice Note – Potentially Contaminated Land (State of Victoria, 2005). A list of Environmental Consultants with particular skills relating to contaminated land management is available through the Australian Contaminated Land Consultants Association website, <http://www.aclca.org.au/>. The association represents the major environmental consulting firms involved in the assessment and management of contaminated sites in Australia.

Design consultant

Key consultants include engineers, architects, and services engineers. Depending on the contracting arrangements in place, the design consultants are engaged by either the developer, client or head contractor. The design consultants work together to design a building that fulfils their client's requirements. The design solution will need to respond to risks identified by the client. In addition, if a statement of environmental audit is adequate for the development, it may require specific design solutions to ensure that exposure to the level of contamination that remain do not negatively impact on occupants of the redevelopment.

A LINE OF INQUIRY: SOME DISCUSSIONS

The discussion above has triggered a flow of related questions. All are important for understanding the subject of urban brownfields regeneration and environmental impact and policy. It is an overview of Melbourne's brownfields for high-density residential redevelopment. Our investigation has focused on structural and institutional aspects of inner-city high-density brownfields. Each serves for both efficiency (performance) and distribution (social welfare) purposes. Although the primary interest of this study is welfare economics, a pressing issue that redevelopment of former Chinese industry cities face (Wu and Chen, 2010b), the institutional structure at Melbourne has generally shown its economic efficiency and distributional fairness.

Efficiency and distribution are 'brothers' in social decision makings for resource allocation. If the dynamical changes of socio-political and socio-economic conditions alter the ways the industry and the market operate, the supply and demand force will eventually alter the physical form or the spatial configuration of urban areas. If this process is looked at from different perspectives, we may capture the changing land use patterns over time in specific urban areas. It is considered that the institutions in Melbourne brownfield redevelopment evolve progressively, which is in clear contrast to the more radical structural change in major Chinese cities featuring fast-pace inner-city brownfield development. This imposes our concern regarding the appropriateness and challenge of directly transferring the Australian brownfield experience to the rapid reshaping of the inner-city built environments in mega Chinese cities. The more critical consideration regarding brownfields in different jurisdiction and regions has led us to some discussion relating to some theoretical aspects and future research direction.

What needs to be unveiled are Australia's history of inner-city brownfield redevelopment especially converting heavy industry area into residential and commercial underpinning a transition into service based economy. Past cases such as Sydney Olympics Precinct, Docklands redevelopment, large suburban site redevelopment are recent cases of similar nature, yet they are not quite the same as to comparable situations in the Europe, the US and Asia. Currently large part of literature comes from the UK and the US possibly due to the fact that intensive industry activities had shaped the past of the two countries and now there is strong incentive to consolidate – similar cases in countries like Canada, Germany and China. This brings the need for continuous research on Australian urban (esp. inner-city) brownfield development (esp. Melbourne and Sydney). The current study shows needs to define the unique features of Australia's brownfields. For example previous studies of inner-city industrial (prefer heavy industry) land being converted into residential

(prefer high-density) and their presence in Melbourne. Investigating and possibly establishing comparability will be one of the tasks for following studies. Currently there is a body of knowledge on brownfields sourced from the globe. Although a pool of literature is assembled 2008-2010, further review is needed to address the above concerns regarding specific research perspective of Australian capital cities, given social, economic and historical environments. The process, system and institutional structure (institutional analysis) may be approached by transaction cost, agency or structure-agent theories (Ball et al 1998). Han and Wang (2003) has looked into the Chinese property market emergence using institutional analysis – it does not cover ‘informal’ rules and norms so perhaps a property rights approach can be introduced when information is more readily available.

CONCLUSIONS

Our discussion is focused on brownfields located in inner-city (where there are high demand) and high-density (again with high demand and high impact) within current or former industrial cities causing strong negative externality. In this paper we briefly discuss inter-related topics including the regulatory framework that governs the development process of brownfields (change of land use and supply of new residential stock), which specifically concerns:

1. The historical background of industrial land use in inner-city area of Melbourne;
2. The types of residential development to be built on the inner-city brownfields;
3. The scope of brownfields (as defined based on research interest) in Melbourne inner-city;
4. The analysis of the regulatory framework (consider welfare distribution given government policy, and the efficiency of market competition and transactions;
5. Stakeholders and the markets

Australia and China have developed different economic models and market institutions. This makes it challenging task for direct comparison and transference of urban regeneration knowledge. In terms of scale, major Australian cities such as Melbourne do not have an industry base that is nearly as intensive as major Chinese cities, and development projects are of much lower density. There are profound structural differences between the two jurisdictions. An overview of the Melbourne inner-city brownfields sector suggests the city is clean given its size and economic conditions. We found all projects are heavily led of the Victorian state government. Case of direct private firm involvement is not popular and all projects have a long term development plan. Most projects are built on former state-owned land and are ‘supervised’ by the government which arguably leads to the internalisation of social costs in brownfields conversion processes.

Detailed scrutiny of the combined market-government framework to treat brownfield regeneration and the effectiveness at the project delivery level will offer further insights to the pressing and challenging task of urban regeneration in cities with heavy industry history and have demand for alternative land use.

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