## Introduction

Australia's economy is currently underpinned by massive resource wealth which has led to sustained economic and population growth over the last decade. Gross Domestic Product growth has made Australia one of the wealthiest places in the world according to the United Nations Human Development Index (United Nations Development Program 2009). However, despite the enviable international liveability status, the aggregated statistics mask a less attractive reality. Evidence suggests that the Australian community has become increasingly polarised by the 'resources boom' due to rising costs of living, of which the cost of housing is a crucial component (Australian Bureau of Statistics 2011a; Conley 2010; Langton 2010). Resource industry-led demand has increased house prices and rents dramatically in resource-rich areas resulting in serious affordability issues for communities, particularly those that service the mines (Haslam McKenzie et al 2009). In Australia generally, housing affordability has declined throughout the last decade but it is in the resource-rich areas, usually remote, isolated, rural locations, where these declines have had serious, negative social outcomes.

Home ownership contributes to social stability, community development, and economic welfare which, according to Costello (2009, p.220) is especially important in non-metropolitan locations; "*housing in rural areas is considered to be vital, not just as an indicator of economic sustainability but also for maintaining rural liveability and community wellbeing*". This statement is borne out by Hassell (2002) who undertook important research into the supply of rental accommodation in non-metropolitan Australia showing the escalating unmet need and social and economic costs which have been largely ignored over the past two decades. Work undertaken for the Desert Knowledge Co-operative Research Centre found housing to be a key determinant for the attraction and retention of skilled and professional staff and their families in remote areas (Haslam McKenzie 2011b); a finding also identified in the Canadian oil sand towns (Oil Sands Ministerial Strategy Committee 2006).

The issue of housing interconnects with additional economic, socio-cultural and environmental indicators, such as health, education, the natural and built environment and social connectedness, which have important bearings on the quality of life determinations of healthy, liveable and sustainable communities (Hillier et al. 2002; Rolfe et al. 2006). For example, there are well established links between housing quality, including overcrowding and insecurity, and health outcomes (Evans 2003, Evans, Wells, Chan and Saltzman, 2000, Sandel and Wright, 2006). A high housing cost burden can impede the capacity of families to account for other necessities that affect wellbeing such as food, clothing and health care (Bratt 2002).

An examination of the relationship between heightened natural resource markets and the impact on wellbeing, particularly in those communities where the resources are derived is not necessarily new. Lawrie et al., (2011) provide a useful review of the literature on the interaction between resource dependence and socio-economic wellbeing in Australia and other countries in the developed world. The authors argue that the socio-economic trajectories of resource boom towns are highly nuanced but not always negative, a finding supported by Petkova et al (2009). However, they acknowledge growing levels of inequality in these areas leading to significant disadvantages for those on lower incomes, a finding echoed in other boom towns throughout the world, for example, Krannich and Luloff (1991) discussing the US and Stedman et al (2004) Canada. However, previous studies have tended to ignore the housing market outcomes and resulting social and economic pressures within resource-based communities.

An oft repeated scenario of resource-dependent communities is the pressure on prices and cost of living due to a sudden increase in migration and demand for labour. The subsequent marginalisation and exclusion of those not involved in the resource industry who cannot afford the prices causes a mono-economy but also dysfunctional communities for lack of supporting services and diversity of people (Wetzstein 2011; Haslam McKenzie et al 2009; Gramling and Brabant 1986).

The immigration effects on housing resulting from a transformation in the local labour market have been observed elsewhere.  Work undertaken by Moos and Skaburskis (2010) noted that labour markets are increasingly global and an influx of prosperous immigrant workers with high incomes can quickly transform local housing markets as demand outstrips supply.  Moos and Skaburskis (2010) and others (Gallent, 2009; Paris *et al.* 2009; Mitchell, 2004; Wilson, 2004) suggest patterns of immigration have important implications for urban housing policy because the traditional relationships between local housing and labour market growth are challenged.

As noted earlier, the impact of resource industry growth on housing markets is not limited to Australia.  The Canadian experience of the mineral sands industry has shown similar trends: exponential growth in the mining industry since the mid 1990s with insufficient housing to support that growth and subsequent shortages (Stedman et al 2004).  The oil sands industry has reaped considerable financial benefits for the provincial government and national economy but the pace of growth has caused pressures on housing supply, essential services and infrastructure (Alberta Provincial Government. 2006).  The impact of the housing shortage has thwarted the attraction and retention of the necessary supporting workforce, most particularly public sector officers, childcare services, transportation and health care providers. Wilson (2004) noted similar oversights in the US.

This paper provides another dimension by focusing on housing market driven outcomes discussing what happens to remote communities when housing markets cannot respond to the rapid growth of employment. Government has a significant influence on housing markets through its control of land release and development in regional areas so plays a critical role in market response. Gallent (2009) is critical of governments' unwillingness to take seriously the housing undersupply issues and the lack of planning to accommodate counter-urbanisation. This paper underlines this dysfunctionality which has had broad economic and social implications in the local community. We draw on a comprehensive study of housing market failure resulting from the current resource mining boom. The paper focuses, in particular, on two communities in remote regions of Australia; Karratha in Western Australia and Moranbah in Queensland (see Figure 1).

[Insert Figure 1 about here]

Both are important mining hubs and have attracted considerable media interest due to the lack of adequate housing and the subsequent economic and social implications of the shortage. The impacts demonstrate the linkages between housing and the resources industry and show the ripple effect on the broader community when the provision of adequate and affordable housing is overlooked.

## Housing and the Australian Resources Boom

Two Australian States, Western Australian (WA) and Queensland, represent some of the most productive and diversified mineral regions in the world and together count as a major source of Australia's export income. The Australian mining and energy sector has experienced sustained growth since around 2001, largely underpinned by the growth in demand for mineral commodities from Asia. In 2011, export earnings from resources reached a record $190bn, a 15% increase on 2010 (BREE 2012). Growth is expected to continue with the total value of export earnings to reach $225bn (2011 prices) by 2016-17 and account for around 75% of all Australian export earnings (BREE 2012). At May 2011, there were 204,000 full time employees directly employed in the mining industry sector, more than double the May 2003 mining workforce (Australian Bureau of Statistics, 2011b). Much of this growth has occurred in small, remote, isolated communities.

In Australia, mining activities tend to be scattered in remote and very remote areas where the dispersement of people can be as low as 0.5 per kilometre. Queensland has regionalised settlement patterns with significant regional population centres along the seaboard and key inland centres. Despite WA being the largest State in the nation by area, its population is only 10% of the nation's total (22.3 million people), most of whom (74%) live within the capital Perth.

The resources boom was a major driver of strong population growth for the last decade; growth which reached a peak in early 2008 when 60,000 people per year were entering Queensland and almost 50,000 Western Australia. This represents population growth of 1.4% and 2.3% respectively in a single year, mainly from overseas migration. In addition, there are interstate population movements to both States from other parts of Australia to take advantage of employment opportunities.

Population growth inevitably places pressure on housing markets. The remote nature of many mining communities explains why, historically, mining companies in Australia have had considerable involvement in housing, particularly in the 1970s and 80s when entire towns were built and maintained by mining companies (Cheshire et al., 2011). For political, social and economic reasons, 'company' towns have either disappeared or been 'normalised'; meaning they are no longer restricted in occupancy and the local government has taken over governance. There has been vigorous argument about who is responsible for the provision of housing and other infrastructure, particularly in small communities whose *raison d'etre* is to service the resources industries. Arguing that they are paying substantial royalties to government, companies publicly resist calls to provide infrastructure and services that they see as being the responsibility of government. Nonetheless, the scale of their presence in an area and their ability to pay much higher salaries than other industry sectors means that mining companies continue to have a significant impact on housing and land market dynamics. With a booming resource sector, there is high demand for housing, to the point that housing is viewed by resource companies as an economic driver given new development is stymied by lack of a locally housed workforce. There has recently been a growing trend towards direct involvement in housing provision by the mining companies in the North West of Western Australia. Resource companies play both a direct and indirect role in housing provision. Resource workers earn salaries far in excess of those in non-resource related sectors (see figure 2 and table 1) so are easily able to outbid competitors and secure housing on the private market, be it through ownership or renting.

[Insert Figure 2 and Table 1 about here]

Evidence in a variety of Australian resource locations over an extended period of time (Haslam McKenzie et al 2009, Gramling and Brabant 1986; Stedman et al 2004; Rolfe et al 2006) shows that scarce housing limits diversity in the economy, the ability for private and public organisations to provide services and the opportunity for the towns to develop mature, functioning housing and labour markets. Moos and Skaburskis (2010) report similar dynamics within Canada ; highly paid mine workers have overwhelmed the housing markets and inadvertently squeezed out key workers and others not involved in the resources industries who cannot afford the high housing costs, creating mono-economies. The status of the resource sector; dominated by multinational companies, and therefore resource based communities, is notoriously volatile because of its dependence on global markets and political cycles (Freudenburg 1992; Stedman et al 2004). Therefore, without addressing housing scarcity with a sense of urgency, many of the other strategies to build regional capacity are likely to fail. The attractiveness of the communities and the continuity of services and infrastructure suitable for families are critical. Due to long term housing and social infrastructure shortfalls, especially in places like the Pilbara region, families tend only to stay in the region for the duration of a job and then move away (Pilbara Development Commission, 2007, Pilbara Regional Council, 2004, Australian Bureau of Statistics, 2004).

The way companies manage the sequencing of resource developments and, conversely, the timing of mine closures and restructuring, has a significant impact on local housing markets and the availability of housing for non-mining residents of the community. Consequently, the housing demand fluctuates depending upon the resource cycle and commodity prices. Again this issue is not unique to Australia with similar issues identified in Canada and the US (see Freudenburg, 1992; Randall & Ironside, 1996; Stedman et al., 2004).

Increasingly, in the absence of sufficient accommodation in mining towns, resource companies are choosing to operate fly in/fly out (FIFO) and drive in / drive out

(DIDO) work arrangements whereby workers travel to work, often by aeroplane and "*stay a pre-determined number of days ('roster') then return to a home location for a set break time*" (Price, 2008, p.8). The employer provides food and accommodation close to the mine site and the work rosters are usually compressed work weeks. FIFO has a number of economic efficiencies for the companies; companies not only avoid the cost of establishing and servicing a town, but also the significant costs associated with decommissioning a town; mine lives are shorter, due largely to technological efficiencies, and FIFO provides corporate nimbleness. The expensive and time consuming regulatory, environmental and planning requirements for a new townsite are avoided with FIFO and there are taxation advantages for companies if workers are not resident (Haslam McKenzie 2011a). A FIFO workforce relieves both government and the corporate sector from the provision of a raft of housing and infrastructure responsibilities (Haslam McKenzie 2011a).

The operation of the resources sector, particulalry in remote, isolated towns with contained housing markets, has had a dramatic impact on local housing dynamics leading directly to declining housing affordability and availability and negative social outcomes (see Hajowicz et al., 2011; Haslam Mckenzie et al., 2009). FIFO and DIDO operations have also changed the nature of many mining towns. These are the themes explored in the rest of this paper.

## Housing, Government Policy and Market Failure

The dominant approach of Australian governments, especially over the past three decades, has been to rely on market forces to deliver housing outcomes with minimal direct government intervention (Beer et al., 2007, Hall and Berry, 2007, Hillier et al., 2002). Direct intervention has been in the form of limited non-market provision of social housing and financial assistance to low income renters and first home purchasers. Governments have also exerted considerable indirect influence on housing outcomes through policy interventions such as taxation, land use planning, building regulations and tenancy law (Beer et al., 2007, Bourassa et al., 1995). However, housing market dynamics in rural and regional areas differ from urban centres and urban centric policy designed to stimulate investment in housing has had little impact in rural areas (Beer et al 2011).

Housing considerations have been largely absent or peripheral to broad regional development policies and processes (Hillier et al., 2002). However, in remote Australia there is considerable policy ambiguity because much of the land in remote Australia is administered by the Crown (government) and key infrastructure and even services provided by both government and large resource companies. As explained by Cheshire (2010) and others (for a review see Lawrie et al 2011) the governance of remote communities, particularly those dominated by mining is not straight forward. In response to neo-liberal policies and subsequent reduction in government services, mining companies have a central role in local governance, engaging with government and community representatives to tackle a range of social and economic challenges, including the provision of housing and key workers. Declining housing affordability in Australia has been a function of both strong demand and limited supply (Senate Select Committee 2008). On the demand side, rapidly growing average incomes, a decrease in household size, population growth and a sustained period of low interest rates have all contributed to high demand for housing (National Housing Supply Council, 2010). Simultaneously, the supply side has faltered with shortfalls in land supply in high demand locations, increased development and planning costs and extended delays in reform processes and the provision of infrastructure (Gurran et al., 2008).

The tightening of the construction labour market due to demand from the rapidly expanding resources sector has caused capacity constraints within the building industry, with adverse consequences for housing infrastructure timelines. These trends have been evident in both metropolitan and non-metropolitan areas but are most pronounced in resource booms areas where demand has dramatically outstripped supply (Haslam McKenzie et al., 2009, Rowley and Haslam McKenzie, 2010, Beer et al. 2011). Table 1 demonstrates dramatic median prices rises in major mining towns of Western Australia. Much of the price growth can be linked to the expansion of mining employment in the towns with prices growing at over three times the rate of the Perth Metropolitan region.

[Insert Table 1 about here]

State governments have multiple and prominent roles in remote regions. Much of the land is owned by the Crown and hence, when land is required for industrial or residential purposes, government takes on the role of the developer. Land has traditionally been released by government as a reaction to market signals, such as large price rises, rather than as a result of a policy delivering a steady supply of developable land. The process of rezoning the land is time consuming and onerous, requiring the involvement and co-ordination of multiple government departments, hence land supply is slow and simply cannot respond to market signals in an efficient manner. Land supply in North West Western Australia, for example, is further complicated by the concept of Native Title which is recognition by Australian law that some Indigenous people have rights to their land based on traditional laws and customs. Native Title clearance is complex and it can take up to ten years for Crown Land to be released to the market. Such delays are critical when housing markets are required to respond to very rapid employment growth scenarios.

## Case Studies

To illustrate the impact of the resources sector on housing markets we discuss below the findings from two case study towns. The methodology adopted for this research was multi-disciplinary in nature including a quantitative analysis of local housing markets and a qualitative exploration of the economic and social outcomes of resource growth on the towns. Interviews and focus groups included representatives from State and local government, the housing and development industries, resources industry, chambers of commerce, local business and indigenous organisations. In-depth analysis of public policy decisions, industrial events and local housing practices supplemented the interview data.

The two case studies reported here are Karratha in the Pilbara region of WA and Moranbah in the Bowen Basin region of Queensland. Both towns have experienced recurring housing shortages and crises for several decades. Both regions are dominated by large scale resources industries; in the case of the Pilbara, iron-ore and the Bowen Basin, by coal. The nature and locations of mining operations in both case study locations, combined with the lack of available and affordable housing, has led the resource sector to increasingly rely upon a long distance commuting workforce. These two towns do not reflect isolated occurrences and the experiences reported here can be translated to many other towns.

**Case Study 1: Karratha in the Pilbara Region of Western Australia**

The town of Karratha was established in 1968 during the 1960s mining boom through a joint agreement between the WA government and iron-ore miner Hamersley Iron. It has a population of 11,725 people and 70% of the Shire's residential dwellings (approximately 5,000 dwellings). The nearest large town with a substantial supply of housing is Port Hedland 242km away, which has its own resource-induced housing boom. With the exception of small satellite towns, Karratha is a self-contained housing market with no affordable, substitute market for households seeking to locate to the town.

The median house price in Karratha at December 2011 was $815,000, around 75% higher than the equivalent Perth metropolitan region figure, despite having a very challenging climate for half the year. Annualised price growth over the last five years was 10.3%, compared to 3.1% in Perth. Approximately 30% of houses in Karratha are owner/occupied with the remainder either owned by government, the corporate sector or private investors. The rental market is under extreme pressure due to a growing population. Rents for modest houses are often in excess of $2,000 (Au) per week and rents per bedroom in shared houses over $500 (Au) per week, double the State median rental price for an entire house.

Housing for key workers such as nurses, justice workers, teachers, police and local government staff is not readily available for lease from the private sector simply because public sector wages cannot support private sector rents. Average earnings for key workers are around $75,000. In Western Australia, the Government Regional Officer's Housing[1] (GROH) organisation does not have an adequate stock of houses to meet demand. Consequently government workers are often housed in the limited

[1] Government Regional Officer's Housing is State funded to provide housing directly to those who work for Government organisations.

motel accommodation, restricting accommodation opportunities for tourists and other potential visitors. It was reported that inappropriate or inadequate housing contributed to a high turnover for key government, medical and education staff, exacerbated by resource companies offering high salaries and generous accommodation options to attract new staff. This has knock on effects for the quality of service offered by these key public organisations.

It is difficult to attract staff for average and low paid jobs due to the cost of housing and there is high turnover in the local population. Karratha residents residing at a different address five years ago was 64.5% compared to 45% for Western Australia overall (Australian Bureau of Statistics, 2007a). Our research found evidence of people living in caravans, backyard sheds, tents, garages and even two couples living in their cars for extended periods of time, often in extreme heat (Haslam McKenzie et al., 2009). Overcrowding, sub-letting, 'hot bedding' (different people occupying the same bed, for different 'shifts' over a 24 hour period) and illegal occupation, place a section of the population in a class of people are not 'seen' or counted by any authority, including the Australian Bureau of Statistics. A significant proportion of people who work in the Pilbara (approximately 45%) are FIFO workers. Most are accommodated in highly regulated, company-controlled work camps with limited interaction with the local community.

As a result of the housing crisis, services normally expected in a functioning community are increasingly unavailable. For example, the paint shop, IT service, dive shop, various tourist operators, gift shop and mechanic have all closed citing the inability to attract and retain staff and/or excessively expensive commercial rents. When businesses close, there is less retail diversity forcing people to leave the town to shop. Fewer paid employees in town means less people to patronise the businesses that are still operational and so the cycle of decline continues. The Pilbara region is too expensive for most retirees and hence, as reflected in the Census, Karratha has very few people aged 65 years and older (1.3% of the population in the 2006 Census compared to 12% for the whole of Western Australia). This removes a large proportion of the volunteering sector and prevents the community functioning in a traditional manner.

Despite evidence consistently reported from 2003 that there was a well established housing crisis in Karratha (Pilbara Development Commission, 2004, 2006, 2007), government, through its land development agency Landcorp, was slow to respond to demand. Earlier reports (Ministry for Planning, 1997, Department of Planning and Urban Development, 1992) identified the inability of Karratha's infrastructure to cope with any increase in industry activity or population base. Unfortunately, there was minimal planning coordination across government jurisdictions and few of the recommendations were enacted by any level of government prior to the onset of the most recent and prolonged resources boom.

Since 2008, Landcorp has increased the supply of lots reaching the market. However, this has done little to ease the pressure on prices in the short term given the strength of demand. Much of this demand is investor driven with attractive rental yields available, often above nine per cent net, double the Perth metropolitan. Other residents have not been so lucky, particularly those households on non-mining incomes living within the rental sector, indigenous households and the elderly, who have been displaced from their communities by the costs of living.

**Case Study 2: Moranbah in the Bowen Basin Region of Queensland**

Moranbah, the main town within the Bowen Basin, is a purpose-built mining town established in 1971 by the Utah Development Company Ltd, and grew rapidly throughout the 1970's and 1980's (Galligan, 1989). From the beginning, Moranbah was an ‘open’ or ‘normalised’ town (rather than a ‘closed’ town), with all regular local government functions. The 2006 Census showed the population of Moranbah growing vigorously and comprising a significant proportion of non-resident workers (Australian Bureau of Statistics, 2008). Other key characteristics of the Moranbah population include a relatively small, stable Indigenous population, a high proportion of young families, a very small proportion of older people (1.1% compared with 12.4% for Queensland) and a mobile population with 56.4% of the population residing at a different address five years ago compared to 47.6% for Queensland (Australian Bureau of Statistics, 2008, Australian Bureau of Statistics, 2007b). The data presented above show very similar characteristics to Karratha.

Many Bowen Basin workers live in the seaboard centres and travel to work in the mines, (a drive-in/drive-out workforce), with many residing in work camps and nearby towns for several days at a time while on block rosters.

The accumulated effects of rapid expansion in coal mining since 2001 include housing rents in excess of $1,200 per week even though house prices are modest in comparison with Karratha at $474,000. House prices increased by 50% from December 2005 but rents by more than 100%. There are limited housing options available with low vacancy rates for rental accommodation and limited social housing. The Department of Housing (2007b) identified a trend towards a significant increase in temporary and informal accommodation and extensive use of single persons’ quarters (SPQs) for mine workers.

Until the most recent resources boom, land and infrastructure in the town adequately met demand but with increased mining activity over the past ten years, expansion has been constrained by both the availability of land and the capacity of existing infrastructure. Moranbah is bounded on all sides by mining leases and dependent on a water supply pipeline owned by a mining company. The surrounding mining leases and the potential value of coal under the Moranbah township results in tension and recurring speculation regarding the possibility of re-locating the town if coal prices make that economically viable. Such speculation contributes to a lack of confidence in the long term future of the town. Ongoing disputes between local government, State government and mining companies have contributed to difficulties in coordinating land development and infrastructure funding.  In the absence of agreement about the scale of projected growth and preferred footprint and sequencing strategies, planning and coordination of water, sewerage, roads, power and telecommunications infrastructure have been inhibited.

Moranbah's land use planning and housing strategies have been matters of considerable contention. Belyando Council strongly resisted housing options that implied impermanence of dwellings, or the town itself, and it has been the primary residential land developer in Moranbah as a result.  However, the local council have not been entirely successful with a significant supply of relocatable SPQs located in the town. Approximately 900 of these are situated in a large privately owned and managed village on the edge of town with others in the caravan park located near the centre of town. SPQs cater primarily for non-resident employees of mining companies and labour contract firms.

Home ownership rates are very low at 43% compared to 62% for Queensland, reflecting expensive house prices and high levels of transience amongst the mining workforce. The housing market conditions are forcing lower income earners out of the market and creating a severe shortage of accommodation (Department of Housing, 2007a). The Queensland government has been criticised by a range of stakeholders, including some from within State government agencies, for failing to understand and respond in a timely and co-ordinated manner to the implications of the coal mining expansion in the Bowen Basin and for not having a government agency with overall policy and coordination responsibility for housing supply/affordability and mining development. Partly as a result, the Queensland government has reformed regional planning and social impact assessment processes to better address housing issues.

As is the case in Karratha, the housing affordability burden in Moranbah is carried mainly by employers and lower income households who are not able to access employer housing benefits. This particularly impacts on smaller and less profitable businesses. It also limits the opportunities for people to move into town unless they have already secured well paid work and accommodation and impacts on the ability of people on low incomes to remain in Moranbah.

## Community Sustainability and Implications for the Future

Both case studies illustrate the housing market impacts of an expansion in the resources sector. While there are winners and losers when it comes to house price rises and rental returns, there are few positive social outcomes. The displacement of residents from rental property, the prevention of new household formation, the closure of businesses unable to secure staff in competition with mining based wages, the impact on tourism accommodation and services and the shortage of public sector workers due to the cost of living has a serious impact on these towns. However, these outcomes are not new; boom and bust conditions have happened before in Australia and worldwide. What is new is the extent of housing market failure.

Since housing has such a significant impact upon the distribution of wealth, housing characteristics and tenure types also affect the welfare of occupants and has important social policy implications. New development in non-resources sectors is stymied by the lack of a locally resident workforce and available accommodation for construction workers from outside the mining region. The limited supply and high cost of housing for purchase and rent creates problems for small and medium size businesses who are pressured to provide or subsidise housing, feeding into higher costs and undermining their competitiveness, or worse, forcing closure. Due to limited accommodation and high cost of living in these towns a range of skill sets for all industries are in short supply. This, combined with the nature and location of mining operations with industry cost structures leads to an increase in long distance commuting, labour force 'cannibalism' and poaching. Mining communities exhibit housing tenure characteristics significantly different to the Australian average. The much lower levels of full homeownership and higher levels of rented properties compared to the Australian average are consistent with the transient nature of mining town populations. Established towns with greater industry diversity have nearly double the levels of home ownership and much lower rates of rented properties.

Further, as shown by Freudenburg (1992) and others (Stedman et al 2004; Rushen 1995), resource dependency renders communities vulnerable and works against the development of resilient or sustainable communities and economies with a diversified employment base. A further consideration is the power and footprint of large mining companies, particularly during boom cycles when they are contributing significant money to government coffers. Australian governments appear to be loath to assert socio-economic priorities over multinational corporate practices.

Acceptance of housing problems as legitimate public policy concerns has been slow in both Queensland and Western Australia. This reflects reluctance by both governments and mining companies to accept their respective roles in facilitating housing market responses and addressing market failure. This situation must be seen in the context of Australia's heavy reliance on private markets for housing provision and, consequently, the limited range of policy levers available to address housing issues. The choice of policy interventions in a given case is therefore influenced by socio-economic and political-institutional factors.

The unwillingness, or inability, of government to respond to demand shifts through land supply has been illustrated dramatically in many of the more remote housing markets. It can be inferred from numerous reports (Senate Select Committee on Housing Affordability in Australia 2008; Pilbara Development Commission 2007, 2006) that Landcorp, the WA government's land and property developer, did not respond quickly enough to market signals and was slow to release land even though prices had been rising rapidly. There is ongoing debate concerning the extent to which a restriction of land supply at the local level impacts on local prices due to the transmission of prices across sub-markets (see Costello and Rowley 2010 and Bramley Leishman and Watkins 2008) however, it is evident that the lack of land supply within these remote mining communities contributed directly to the rapid price rises identified in table 1 (Haslam McKenzie et al 2009; Rowley and Haslam McKenzie 2010). Within housing markets where there are no substitutes, or substitutes are limited to very small satellite towns; the case in many of the remote resource based towns, demand cannot be diffused and the full effect of demand shifts are felt locally through house price and rent changes. In such cases, a failure to respond to demand shifts through an immediate response in land supply results in short term boom conditions.

The situation is further complicated in remote housing markets in regional Australia due to the nature of the development industry. The industry is structured very differently from the UK, for example. Developers sub-divide land and sell individual lots to consumers who then contract a builder to deliver the housing product. This limits the capacity of the market to respond quickly to demand changes with development passing through two distinct phases, reducing potential economies of scale. While the majority of land in regional Australia is Crown owned, the ability of the Government to respond to demand shifts is slow even when Native Title has been cleared. Mining clearances and environmental approvals are all required for land release, together with the installation of the necessary development infrastructure such as roads, power, water and sewage services; complex and expensive in remote locations.  Such interventions prevent any housing and land market from responding efficiently to market demand. Labour and material shortages, transport costs and lack of accommodation for construction workers are common challenges to be overcome in expanding housing supply in mining towns. In some circumstances, the reluctance of financiers to lend on homes in mining towns or their requirements for significant deposits before approving mortgages provides a further barrier to investment for home ownership and rental accommodation. The high rent to house price ratios in Karratha and Moranbah indicate that investors are able to generate higher returns in remote towns reliant on mining. This partly reflects the risks involved due to less predictable capital appreciation over the long term, but also the structure of the market with intense pressure for rental accommodation forcing up rents as owner occupation is not an option for the vast majority of individuals or households. These high rents are also sustained by a lack of alternatives due to the remote location and the capacity for mining companies and high income employees to pay premium rents, thus reinforcing resource dependence and exacerbating the community's vulnerability to the international economy and resource markets.

Planning plays the vital role in allocating land for future development. However, many planning authorities in remote communities are understaffed and suffer from a high rate of turnover due to housing affordability issues. This creates uncertainty for developers that deal with planning staff, and a disjointed approach to decision making. Uncertainty is compounded by a lack of information about mining expansion plans that could affect demand in the town making it virtually impossible for local authorities to plan the future release of land. Oversupply and a market downturn may follow; undersupply and a boom results.

## Concluding Remarks

Patterns of boom and bust in the resources industry are irregular and difficult to predict. When combined with the rural and remote locations of most mine sites and the lead time required for housing development, it is unsurprising that residential land and housing supply markets are slow to respond to the requirements of increased demand. Given the nature of remote housing markets, demand changes are accentuated and boom and bust conditions inevitable without public sector intervention.

It must be emphasised that difficulties in aligning housing supply with production demands is just one of the factors contributing to the increasing reliance of mining companies and contracting firms on FIFO and DIDO employment practices. Other significant factors include the preference of workers and their families to be based in capital cities or seaboard centres and the need to consider the sustainability of housing investments in locations with volatile mining activity.

The cyclical nature and employment practices of the mining industry therefore means that analysis of housing issues is extremely complex, requiring both temporal and spatial considerations. Temporal considerations include the housing implications of establishment, operational, expansion, wind down and closure phases in mining. Spatial considerations include housing impacts at a local and regional level as well as for the key base locations for non-resident workers.

The housing stresses found in the case study towns point to a lack of robust policy frameworks or governance arrangements capable of managing the housing implications of the resources boom, particularly within the context of large multi-national corporations and global markets. These stresses are both economic and social. Housing affordability pressures create community fragmentation and a lack of subsidised housing options in remote communities causes displacement, particularly within society's most vulnerable groups. There is also displacement of local businesses which affect the economic competitiveness of the very towns that are supposed to be the centre of the 'resources boom'.

To avoid these economic and social consequences, the public and private sectors need to ensure a certain level of cooperation. Functioning housing markets are essential in delivering an adequate labour supply and enabling labour mobility. In such remote locations adequate land supply is essential to deliver a constant flow of new dwellings. However, the traditional, suburban development structure of dwelling delivery in Australia; land subdivision, land purchase and individual dwelling development by the purchaser, prevents an efficient supply response. What is required is a fundamental shift in the provision of housing within such towns.

Indicators of shortcomings in policy and governance include:  lack of accurate information to inform planning; fragmentation in responsibility; confusion of roles; and lack of forums capable of mediating between conflicting interests or co-ordinating responses. There is need to improve coordination within and between the different levels of government and, in turn, between mining companies and government. Better planning is critical to ensuring an adequate supply and mix of housing in mining communities and, in particular, to address the issue of affordability. However, the planning system cannot respond adequately in the short term if the level of demand is unknown until just months before a resource expansion.

While towns are vulnerable to the resources super-cycle their future is tenuous. If an effort was made to plan and design towns to enhance liveability and attractiveness, there is a greater likelihood of increased private investment in businesses and the community. Broadening the demographic and economic diversity of resource boom towns is essential if these communities are to achieve some measure of sustainability. This includes government's responsibility to ensure that economically disadvantaged people living in mining regions are not forced out, or kept out, due to a lack of affordable housing and/or infrastructure.

There are a number of obstacles to achieving effective planning, including the wide range of stakeholders that need to be involved in the process, the often limited capacity of local government and the regional offices of State agencies, and the inherent difficulty of predicting the scale and timing of future growth (particularly in a market-sensitive industry such as mining). Addressing these issues requires the establishment of new governance mechanisms at the regional level to provide a framework in which companies and the different levels of government can share information and collaborate on matters of common concern. Government's role is to lead and provide strategic guidance that will facilitate rather than hinder sustainable socio-economic and environmental development. It must also lead in the management of often complex cultural issues.

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