LAND USE PATTERN OF PRIVATE HOUSING DEVELOPMENT SINCE THE INTRODUCTION OF BRUNEI’S COMPACT STRATEGY

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This study looks into the implementation of Brunei’s Master Plan proposal for compact strategy of developments within the designated Urban Footprint zone. Although the Master Plan lacks regulatory support, this study found that private housing developments have been mainly concentrated within the Urban Footprint zone and a more compact urban form through infill and higher density developments is being realized. This may be due to government administrative processes, housing trend and market demand. However, if existing land distribution and issue of access is not solved, it will be a challenge to commit to this strategy in the future.

Keywords: Compact Strategy, Urban Footprint, Land Use, Private Housing Developments, Brunei-Muara District

1. Introduction

1.1 Background

Urbanization in Asia has been taking place at a rapid rate and this has posed major challenges to the Asian cities. This uncontrolled urbanization has led to inefficient use of land, disorganized infrastructure provision, deteriorating environment and loss of green areas. Urban areas also face the pressure of rising housing demand and requirement for better infrastructure and services. The need for sustainable urban growth has led various countries to adopt new policies or tools emphasizing on a more compact urban form. Generally, in developed countries, a more rigid system to control suburban urbanization is adopted such as the use of Urbanization Promotion area & Urbanization Control area in Japan. On the other hand, in developing countries of Asia, few countries have similar measure but with weak implementation.

According to the Asian Development Bank (2015), Brunei has the second highest percentage of urban population in South East Asia at 76.9 percent in 2014. Housing development has been one of the main factors influencing the land use pattern and subsequently the growth of urban areas in Brunei. In an attempt to control its urban growth, Brunei has introduced a compact strategy for developments within urban areas in the new Master Plan (MP) revised in 2008, which includes an Urban Footprint (UF) zone to limit the extent of urban growth.

One study on Public housing developments found that current Government practices in Public housing provision are moving towards achieving a higher density development within the UF zone through changes in housing allocation and design policy. On the contrary, not much can be said on the recent developments of private housing, as there is a lack of specific studies already undertaken on this. Assessment of recent private housing developments is essential to evaluate the overall influence of the compact strategy, and will thus be the focus of this study.

1.2 Planning and Development System in Brunei

Brunei is divided into 3 types of administrative areas that are not local governments’ jurisdictions. The largest is Districts that can be divided into Mukims and further smaller areas called Villages. In general, developments in Brunei, are influenced by the Land use planning system and the Development control system. In recognizing the increasingly urbanizing trend of the country, these two systems have undergone various revisions in recent years and Fig.1 shows the two systems in relation to housing developments.

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Land Use Plans consist of three level plan hierarchy (Fig.1). The MP sets the policy direction and general zones (such as UF zone) for the whole country. While District Plan and Local Plan provide more detailed zoning such as Residential zone at the District plan and High Density Residential zone at the Local plan. Currently in its Second MP, the recent National Land Use Master Plan 2006-2025 (NLUMP), proposed a new growth strategy and 5 national land use zones that provide spatial context for the policy directions. The UF zone (Fig.2) is one of the land use zones whereby it defines the limit of urban expansion up to the year 2025 to arrest the occurrence of sprawl and promote an efficient urban land use[2][3]. Other 4 land use zones, in general, are intended to inhibit or limit the occurrence of development. The MP, however, is a non-statutory document and thus, does not have strong regulations to control developments outside of the UF zone.

At present, new developments in the country need to undergo development control procedures involving two main processes; Planning Permission and Building Approval system. In principal, planning permission approval would need to ensure that development proposals are in accordance with land use plans. In Brunei, however, the private land title would dictate the use and sometimes density allowed for that land[3][9]. These stated uses are not necessarily in accordance with land use plans. Developments would also need to follow standards provided by planning guidelines through the administrative process and also building codes. In general, development approval will thus be given regardless of their location within or outside UF zone as long as it complies with the above conditions and standards. New administrative procedures regarding allowable density, however, are being introduced to help promote compact developments inside the UF zone.

1.3 Review of Urbanization in South East Asia

Asia-Pacific region has some of the largest cities in the world, nevertheless, the pattern and outcome of urbanization in this region varies[4]. General features of urbanization in Asian cities can be said to include a mixture of land uses, faster growing urbanizing areas, declining inner city areas and expansion of peri-urban areas[5]. Bangkok as an example, has its outer core undergoing major growth whilst also experiencing its primary core declining or in stagnation[6]. Similarly, Kuala Lumpur city center has a decline in residential use with more people locating to the suburban areas not only for access to more affordable housing but also due to preference in landed housing which may not be available in city center[7][8]. The continuing spread of urbanization is also a result of improvement of the infrastructure networks by the government[6][9]. In Indonesia, infrastructure has played a major role in the country’s sprawling pattern[10]. These countries at present have some form of plan in place to guide their development. Although, not specifically having an urban containment strategy, some controls such as zoning have been proposed. However, despite this, these countries have shown that their urban areas have continued to grow outwards. McGee (2009) mentioned that in South East Asia, particularly countries of mega-urban regions, the existing management and government systems with their limited capacity are unable to cope with the urban problems due to the rapid pace of developments[9]. Inadequate and flexible use of plans, coupled with influence of market forces have also contributed to this[11]. Asian cities thus need a more concrete strategy for its urban management.

In Brunei, the capital district of the country (Brunei-Muara district) has been experiencing most of the rapid urbanization and growth of urban population. A review of the achievements of the first MP, Negara Brunei Darussalam Master Plan of 1986-2005 (NBDMP), found that only a few of the proposed spatial and population distributions were achieved and the sprawling development pattern could not be fully controlled[3]. Under the recent second MP, the preferred development scenario for Brunei-Muara district is for a compact strategy to be undertaken. By definition, the compact strategy is a development strategy of consolidating future urban development within the existing UF zone. Under the MP’s policy measure for achieving a compact form of urban development, infill development and higher densities within the UF will be promoted[3]. However, since the completion of the second MP, only few studies have been done to assess the effectiveness of Brunei’s compact strategy with none specifically targeting on the influence of private housing development.
2. Purpose and Methodology

As can be seen in discussion Section 1.2 & 1.3 above, Brunei has a non-strict regulation in land use control similar to other South East Asian country. However, Brunei’s approach in promoting compact developments within its urban areas can be a possible alternative practice to controlling urban growth in this region. The main purpose of this paper is to review the implementation and effectiveness of the second MP’s compact strategy although without having rigid regulation to control developments outside of UF zone. The objectives of the paper are firstly to analyze the land use pattern of private developments in the case study areas before and after the introduction of the compact strategy, and secondly to review the characteristics of recent private housing developments and the issues that remains unsolved or created through these developments.

In order to achieve the above, three types of method for analysis were undertaken.

a) Analysis of Population at District level
To confirm the effectiveness of the UF zone, changes of Population at the District level was analyzed. National census data on population for all villages in Brunei-Muara district were obtained for the years 1981, 1991, 2001 and 2011.

b) A Analysis of Developments in Mukim level
1) Urbanization pattern of the Mukims was classified based on cluster analysis of housing data. Case study Mukims were then selected based on areas experiencing different forms of urbanization.

2) To confirm the achievement of compact strategy in the case study areas (Mukim Kilanas and Mukim Sengkurong), firstly analysis based on the land size and type of developed housing were undertaken in order to understand whether there have been any changes towards a much higher density development. Secondly, developments were mapped out to examine the distribution of new developments. The mapping was done using GIS software.

c) Analysis of Development Patterns at Village level
To understand the pattern of development in the suburban areas, typical villages of varying urbanizing trends were chosen. Developments were mapped out and analyzed to identify their characteristics.

The data sources for b) & c) above were Aerial Photography/Satellite imagery supplied by the Department of Survey for the year 2009 and 2014, Permits (building approval and planning permission) during the period 2009-2015 and individual lot information for private lots developed before year 2009, both issued by the Development Control Competent Authority. The data obtained from these Departments include land use, land size and year of development. As this research is focusing on Private Housing developments, some villages that are entirely or partly containing Public Housing developments were excluded from analysis.

3. Population Analysis in Brunei-Muara district
The total population of the country has been steadily increasing over the years, with the percentage of total population living in Brunei-Muara district growing from 59.3% in 1981 to 71.2% in 2011. This increase shows that the capital district continues to play a major role for the country compared to the other three districts in Brunei. In order to confirm the effectiveness of the UF zone, analysis of population data within a period of thirty years was undertaken whereby data of each period were divided and calculated according to area of inside and outside UF zone. It should be noted that the UF zone was designated in 2008.

From assessing the population changes in Table 1, the increase in population experienced by Brunei-Muara district occurred both inside and outside the UF zone with most share of population consistently remaining inside the UF zone. Table 2 and Table 3 further shows that increase in population density and population growth index within the UF zone have been higher than outside the UF zone in the ten-year period of 2001-2011. Although the UF zone did not restrict developments outside the zone entirely, these results suggest that most population is contained inside the UF zone, and grew denser and faster than outside the UF zone.

Results from the population analysis alone do not fully explain the development trend of the district, nor firmly prove the effectiveness of the UF zone. Moreover, the population analysis carried out above has been undertaken up to the year 2011 (latest official national census) which is only 3 years after the introduction of the second MP. Therefore, it is difficult to verify that most of population growth within the UF zone occurred after 2008, thus a more detailed analysis should be undertaken in the form of a case study area analysis based on different sets of data.

4. Classification of Urbanization and Case Study area selection

4.1 Classification of Urbanization
To classify urbanization types, firstly the villages with decreasing number of occupied housing were removed from cluster analysis and categorized as declining villages. Secondly, the remaining villages were classified using cluster analysis (ward’s method with square Euclidean distance) based on three index (occupied housing density 2001, occupied housing density increase 2001-2011 and % occupied housing increase from 2001-2011), and a further 5 types of urbanization types were classified. The dendrogram result is shown in Fig.3 and Table 4 shows the averages of the index respectively including type vi as declining village. Therefore, as a result, 6 types of urbanization can be classified.

The map of this classification (Fig.4) shows that all of the urbanized villages (i in Table 4) are located within the city boundary. However, the center of this city area is mainly undergoing a decline (vi) or having few changes in number of occupied housing (iv & v). Some villages within parts of the city center can also be found to be urbanizing (iii) or rapidly urbanizing (ii). In outer city area, villages undergoing urbanization (iii, iv, v) are scattered. Low density with few changes villages (v) are mainly found in the western and southeastern part of the district, which is zoned as Non-urban/Rural. However, even outside of UF zone, some villages located within this Non-urban zone are also undergoing urbanization.
Table 1 Population change in Brunei-Muara district

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Inside UF</td>
<td>76,099</td>
<td>124,935</td>
<td>155,363</td>
<td>185,091</td>
</tr>
<tr>
<td>Outside UF</td>
<td>7,361</td>
<td>10,593</td>
<td>12,351</td>
<td>16,191</td>
</tr>
</tbody>
</table>

Table 2 Population density

<table>
<thead>
<tr>
<th>Year</th>
<th>Inside UF</th>
<th>Outside UF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981</td>
<td>2.855</td>
<td>0.619</td>
</tr>
<tr>
<td>1991</td>
<td>4.682</td>
<td>0.871</td>
</tr>
<tr>
<td>2001</td>
<td>5.822</td>
<td>1.039</td>
</tr>
<tr>
<td>2011</td>
<td>6.936</td>
<td>1.362</td>
</tr>
</tbody>
</table>

Table 3 Population Growth Index

<table>
<thead>
<tr>
<th>Year</th>
<th>Inside UF</th>
<th>Outside UF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>1991</td>
<td>164</td>
<td>143</td>
</tr>
<tr>
<td>2001</td>
<td>200</td>
<td>168</td>
</tr>
<tr>
<td>2011</td>
<td>243</td>
<td>219</td>
</tr>
</tbody>
</table>

Table 4 Averages of index for each classification

<table>
<thead>
<tr>
<th>Classification of villages</th>
<th>Occupied housing density 2001 (units/ha)</th>
<th>Occupied housing density increase 2001-2011 (units/ha)</th>
<th>% occupied housing increase 2001-2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>i Urbanized</td>
<td>3.492</td>
<td>1.297</td>
<td>40.564</td>
</tr>
<tr>
<td>ii Rapidly Urbanizing</td>
<td>1.497</td>
<td>2.576</td>
<td>174.663</td>
</tr>
<tr>
<td>iii Urbanizing</td>
<td>0.511</td>
<td>0.600</td>
<td>125.505</td>
</tr>
<tr>
<td>iv Medium density with few changes</td>
<td>1.780</td>
<td>0.225</td>
<td>14.045</td>
</tr>
<tr>
<td>v  Low density with few changes</td>
<td>0.541</td>
<td>0.205</td>
<td>36.480</td>
</tr>
<tr>
<td>vi Declining</td>
<td>1.542</td>
<td>-0.484</td>
<td>-28.66</td>
</tr>
</tbody>
</table>

Note: i-v are classified types of increasing villages, and vi is a type of decreasing villages.

Fig.3 5 classified types of urbanization in villages with increasing housing.

Note: The marks of i-v of clusters are same as the marks of left column in Table 4. Declining villages is a separate classification which is included in the clustering of Table 4.

Fig.4 6 classified types of urbanization in all villages.

Note: * are not included in the classification such as Government areas, empty, or villages with Public Housing.

Fig.5 Developments on private land in case study Mukims and 4 selected villages.

Fig.6 Urbanization/growth tendency of selected villages.
4.2 Case study area selection

From the result of classification, Mukim Sengkurong and Mukim Kilanas have been taken as the case study areas for further analysis (see insert in Fig.4). These two Mukims were selected because they contain villages with different urbanization types. Moreover, the location of these two Mukims provides a good comparison as Mukim Kilanas is located partly within the city boundary and Mukim Sengkurong is located further from the city boundary. In these case study Mukims there are 23 villages altogether and out of this, 3 villages are entirely or having most of its land area located outside the UF zone.

5. Housing Development and Pattern analysis

5.1 Development analysis at Mukim level

The compact strategy proposes that infill developments of higher density should be encouraged. Thus, firstly both selected Mukims were analyzed on compactness of development through comparison of two sets of data; housing types and land size of developments within the different periods. Secondly, distribution of developments was analyzed. The data sources are the number of completed houses up to 2015 and also planned houses which development applications were submitted in 2015. Due to limited availability of data and the satellite imagery available were for the year 2009 and 2014, the comparison was done before and after the year 2010 which was after the compact strategy was adopted. Also, it should be noted that the developed housing calculations in this section is different from occupied housing used in section 4.1.

Detached housing had always been the preferred housing choice for families in Brunei and this is clearly shown from Table 5 whereby detached housing developments before 2010 accounted for more than 80% in both Mukim Kilanas and Sengkurong. Detached houses although still being the major type of new housing in both case study areas, the proportion of it has decreased drastically since 2010 with a larger choice of semi-detached, terraces and apartments/flats being built since this period. This trend is expected to continue, as the number of developments approved by Planning permission in 2015 and planned for construction shows a further decline in the provision of detached houses.

As for the average lot/land size of developed housing (Table 6), the two Mukims have decreased sizes in the period 2010-2015 with Mukim Kilanas showing a drastic decrease to almost half the size of those developed before 2010. From these results, both case study Mukims indicate that new developments are becoming higher density in conformity with the compact strategy.

For analysis of development distribution, developments in the case study Mukims were mapped out. Fig.5 shows that grey lands were developed before 2010 and black lands were developed between 2010-2015. Through the analysis of these mapped developments, it was found that most of developments are located within villages inside the UF zone. Further analysis of the location and the calculating the number of these black lands also showed that about 71% and 76% of the new developments in 2010-2015 in Mukim Kilanas and Mukim Sengkurong respectively were through infill among existing built-up area.

5.2 Development pattern analysis at Village level

The following part of this paper will compare the land-use distribution/pattern and characteristics between 4 different types of villages (Urbanized, Urbanizing within UF, Urbanizing outside UF and Low density with few change) as shown in Fig.5. Only part of these selected villages considered a representative urbanizing area of the whole village are shown in Fig.7 & Fig.8. Fig.6 shows the urbanizing tendency of the 4 villages by comparing before and after adopting compact strategy. The indexes used were % housing increase and Housing density increase calculated per year.

Firstly, from the analysis and comparison of development pattern in Fig.6, Fig.7 and Fig.8, the followings were found.

Before 2010

- In Bunut (Urbanized village) many developments were occurring before 2010. The location within the city boundary made this area one of the earlier urbanized villages. Due to the small size of this village, most of the private lands were developed resulting in a high Occupied housing density increase between 2001-2011.
- Mulaut (Urbanizing village in the UF zone) experienced high rate of Occupied housing increase yearly (13.8%) thus resulting in a 138% increase between 2001-2011. The village also has a land pattern that

Table 5 % Distribution of Housing types in Mukim Sengkurong & Mukim Kilanas (completed & planned)

<table>
<thead>
<tr>
<th>Housing type</th>
<th>Mukim Kilanas</th>
<th>Mukim Sengkurong</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detached</td>
<td>88%</td>
<td>91%</td>
</tr>
<tr>
<td>Semi-detached</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Terraces</td>
<td>7%</td>
<td>8%</td>
</tr>
<tr>
<td>Flats/Apartment</td>
<td>4%</td>
<td>*</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 6 Average lot sizes of developed land within two Mukims

<table>
<thead>
<tr>
<th>Mukim</th>
<th>Average Lot size In and before 2009</th>
<th>Average Lot size Between 2010-2015</th>
<th>Approved Overall Lot size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mukim Kilanas</td>
<td>1362 m²</td>
<td>799 m²</td>
<td>1230 m²</td>
</tr>
<tr>
<td>Mukim Sengkurong</td>
<td>1409 m²</td>
<td>891 m²</td>
<td>1292 m²</td>
</tr>
</tbody>
</table>

Note: The calculation does not include land developed for multi-story housing such as flats and apartments.

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is orderly in terms of land shape and road access.

- Jangsak (Low density with few changes village) experienced lower change in % occupied housing increase between 2001-2011 in spite of its location near to Mulaut.
- Mulaut and Jangsak are both easily accessible to the city center with the arterial roads passing through both these villages. Although both villages have similar conditions such as accessibility to the city center and local commercial areas, the urbanizing tendency of 2001-2011 is different. This may be due to the character of the villages whereby Mulaut is a flat land and Jangsak is undulating topography which may be costly to develop.
- Katimahar (Urbanizing village outside the UF zone) is urbanizing with development pattern mainly concentrated along main roads. The % of occupied housing increase per year in 2001-2011 was 9.6%, however, the number of development lots can be said to be small.

Between the period 2010-2015 (after implementing compact strategy)

- Most new developments in all 4 villages were developed as infill within existing built up area.
- Bunut’s growth has slowed down greatly with only a few developments occurring. The remaining undeveloped lands continue to be empty possibly due to the lack of access.
- Mulaut continued to urbanize but the rate has slowed down to 38% for the % developed housing increase in 5 years between 2010-2015. Contrarily, Jangsak began to urbanize faster with a comparatively higher density. While Jangsak’s topography remains difficult to develop, the development of higher density housing such as terrace has made the % housing increase and density increase high. In addition, it is estimated that after 2010, both Mulaut and Jangsak will grow higher than other villages at more than 7% increase/year.
- Although being outside the UF, Katimahar continues to be developed in accordance with the land title. However, the growth in housing has slowed down between the period 2010-2015 and the average land size of developed housing remains large at more than 1000m².

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Fig.7 Development pattern for Urbanized and Urbanizing villages
In addition, large Commercial/Industrial land use has also been developed in period 2010-2015.

Secondly, the characteristics of developments were identified.

- In terms of average developed housing land size, in general, there has been a decrease in all 4 villages in 2010-2015 (see data in Fig.7 & 8). Mulaut and Jangsak have a great decline in land size. This shows that lands in both villages within the UF zone are becoming smaller. These villages also have more variety of new housing types such as semi-detached & terrace.

- Katimahar has a larger average size for developed land than the other 3 villages. This shows that size of land remains bigger outside of the UF zone.

6. Discussion

6.1 Land use patterns

Through the analysis of this paper, firstly it was found that like other countries in South East Asia, Brunei also shows a similar trend of declining or slow growth area mainly concentrated in the city area. However, some parts of the city are still urbanizing and the suburban areas continue to urbanize in varying rate.

Most of the urbanization has also been occurring within the UF zone. However, due to the non-statutory nature of MP which has no restrictions outside the UF zone, developments outside this zone cannot be controlled. This can be seen whereby some villages just outside the UF zone has started urbanizing. These villages can be said to have good accessibility and also the option of larger land size. Whereas looking at a more local scale (Mukim and Village level), new developments have been mostly undertaken as infill development within existing built-up areas. After 2010 (implementing compact strategy), villages such as Mulaut continues to grow, even though the rate of increase index has slow down.

Secondly, since 2010 there has been a change in the characteristics of housing developments. For new housing developments, there has been a shift towards higher density; more variety of housing types and smaller
land sizes. This is clearly seen in case study Mukim Kilanas. From the selected villages, although density varies among these villages, new higher density type of developments can be found in villages within the UF zone. As can be seen in villages Mulaut and Jangsak, the developed housing increase density after implementing the compact strategy is much higher than outside of the UF zone.

Both of the above patterns indicates that even without a strict control of urban expansion, most of developments have concentrated inside the UF zone and have moved towards higher density housing development.

### 6.2 Factors influencing effectiveness of the non-statutory strategy

The following attempts to suggest the possible reasons that may result in the findings above.

1) Current government policy and practice

The Ministry of Development has introduced the Strata title act in 2009 which allows for the titling of multi-story/high rise development to enable residents to buy the housing units. In addition, a new policy has been introduced in 2008 regarding the allowable density of a residential land. The density of housing stated in land titles, which can be as low as 4 units per acre to the highest of 24 units per acre, is not necessarily to be adhered. Lands with residential use are currently permitted to build to the highest density of 24 units per acre, subject to the relevant Development control authority’s evaluation, regardless of the density stated in the land title. This is practiced particularly in the UF zone. This policy alteration has resulted in the simplification of procedures whereby the need for owners to go through land title upgrading procedures, which can take a long time for processing, can be avoided. These changes in government policies and practice are intended to promote higher density housing development and better utilization of lands in areas inside the UF zone and this can be observed as the tendency happening after 2010.

2) Housing trend affected by public housing provision and market demand

The move towards more compact housing type on private land may also be attributed to the trend being implemented in public housing whereby the provision of detached houses has shifted towards the provision of semi-detached and terraces presently and apartments in future. Government’s effort to promote higher density in public housing has indirectly influenced the private housing. It became a trend of which residents are now slowly more acceptable to such compact housing type. Moreover, there has been a decline in family size that may indicate less need for bigger types of houses.

Public housing has been a popular choice among residents of Brunei due to the subsidized price of the house. However, the waiting list for public housing is currently high with a difference of 16,434 between housing production and demand and commonly it would take more than 5 years before one will be granted with a house. This has influenced the demand for housing in the private sector. Demand and the rising housing price have resulted in the need to look for different housing options. Thus opening up the opportunity for developers to provide housing choices that align with the affordability of potential owners.

3) Influences by infrastructure, topography and policy

The level of infrastructure has undoubtedly influenced the pattern of development in general, as more accessibility to major roads and convenience to services such as commercial areas affect development location greatly. However, the differences of urbanization before 2010 for villages Mulaut and Jangsak, even though both have similar location and condition of infrastructure, could also be influenced by the topography. The urbanization tendency after 2010 for both Mulaut and Jangsak within the UF zone, however, is kept much higher than Katimahar (located outside of the UF zone).

It should be reemphasized that the policy of the compact strategy within the UF zone with administrative support to promote higher density infill development has bigger influence than infrastructure and topography as a main factor to occur this difference.

### 6.3 Potential problems of compact strategy

From the analysis of distribution pattern, it was also found that there are problems present that could hinder the full implementation of the compact strategy in the future. The issue is less availability of developable lands which resulted from existing land conditions and also infill developments. Such land conditions include irregularly shaped lands which may hinder the optimum use of the land, and scattering distribution of lands which will be difficult to develop as it is far from existing services. Some lands also either remain not connected to existing access or are landlocked by other private lands surrounding it.

The piece-meal nature of planning permission to controlling development and the character of infill developments has been unable to solve the problem of access. Without the surrendering of land for roads by new developments, back lot lands will have difficulty in obtaining access. Moreover, the sizes and form of existing roads are also inconsistent. Therefore, some developable lands within the existing built-up area may not be able to cater future high density. In addition, the absence of a local level plan at present to properly guide development has also impacted this situation.

### 7. Conclusion

Brunei’s MP has proposed a compact strategy that would maximize the use of urban land within the designated UF zone. Even without an institutional restriction outside the UF zone, the MP has an effect for containing almost of urban development inside the UF zone.

The government introduced new administrative approach to guiding high density private developments within the UF zone with the use of housing density control. With this new procedure and at the same time providing flexibility in locating higher density housing developments
seems to be effective measures that may provide other countries with something to reflect. These approaches would have enabled the market to provide various housing choices at different locations particularly within the UF zone to cater to the preference of different people.

Brunei’s compact strategy, however, does not have a stricter control on development outside the UF zone to lessen the growth outside of the UF zone. Also, the infill developments in existing built-up areas might further produce irregular shape of lands and inaccessibility of lands to roads. Such development patterns will be a problem, as it will have an effect on the efficient use of land. If these issues are not solved, future developments may not concentrate in areas inside of the UF zone.

**References**


**Notes**

*1) Brunei has a total of 4 districts with 38 Mukims and 408 villages (including water villages). Brunei Muara district has an area of 571 km$^2$ and is the smallest district. Local plans include Mukim, villages or smaller local areas.

*2) The land area included in the UF was decided through existing extent of previous sprawl and also estimation of future population projection and land use demand.

*3) There is also exception of landuse, whereby lands with agricultural conditions are allowed to be built with one house.

*4) Cadastral data and Satellite Imageries (Spot Image 2009 & Geoportal Imagery 2014), obtained from the Department of Survey, November 2015.

*5) Public Housing are housing provided by the government under the National Housing Scheme or Skim Tanah Kurnia Rakyat Jati. Villages with public housing are excluded as they affect density calculation greatly.

*6) Villages that has most area within UF zone are calculated as within UF zone and water villages are excluded.

*7) The area used in the calculation of density excludes undevelopable State land such as Ridge areas.

*8) Throughout the years there has been changes in administrative boundaries, some villages have to be combined for consistency and to give a better comparison of data. Therefore, it should be noted that villages with boundary adjustments may affect the total number of housing units.

*9) The UF zone boundary is a rough indication in MP and is subject to refinement in lower level plans.

*10) Infill is defined as development within existing urban areas. To determine whether new developments are infill or otherwise, boundary of existing developed area in 2009 were firstly drawn and secondly, location of new developments were assessed in relation to existing developments in immediate lots.

*11) The land size calculation does not include land developed for multi-story housing such as flats and apartments.

*12) New developments would need to have their own access before building approval can be approved. Therefore, all developed lands are connected to roads in Fig.7 & Fig.8.

*13) Previously, any land owners wishing to build higher than the stated density in the land title would need to go through a land title upgrading process. A application for development will only be allowed once approval for upgrading is approved.
和文要約

東南アジアの諸都市では急激な都市地域の拡大が見られる。プルネイの首都があるプルネイダルマ地区も同様に強い都市化圧力の下にあるため、都市地域の拡大をコントロールし、コンパクトな都市づくりに方針転換するために、2008年にマスタープランが改定され、新しい都市成長戦略が採用された。具体的には、プルネイダルマ地区に対して2025年までの都市拡大を制限するアーカンブットプリントと呼ばれるゾーン設定と高密度な住宅開発の推進を主な内容とするコンパクト戦略が導入された。しかし、マスタープランはその拘束的な計画であり、しかもアーカンブットプリントの外側における法制度による開発規制はない。

本研究はこのような開発規制を伴わないコンパクト戦略の下での住宅開発コントロールの効果と課題を明らかにするために、民間住宅開発に焦点を当て、初めての政府の人口統計によるアーカンブットプリント内外の人口分析。第二にケーススタディ地区を選定し、民間住宅開発がアーカンブットプリント内に収まっているか確認するためには開発の分布、高密度な開発になっているか確認するために開発された土地の規模、その土地で供給される住宅形式を分析した。

第三に、郊外地域の民間住宅開発の特徴とそれによってもたらされる問題を把握するために、ケーススタディ地区の中から都市化の程度が異なる4地区を選定し、詳細に開発実態を分析した。

その結果、民間住宅開発の大部分はアーカンブットプリント内で行われていること、多くの住宅開発は既存都市地域内あるいはその隣接地で行われたインフィルであること、戸建て住宅から二三層あるいはテラス型となる高密度な形式への変化が確認できた。その要因として、アーカンブットプリント内で行われる高密度な住宅開発について開発審査の手続きの簡素化や時間の短縮化などの行政的支援が存在すること、公共住宅の分野ではすでにコンパクト戦略に沿ってアーカンブットプリント内で高密度な住宅供給が先行しており、その供給によって戸建て住宅志向の強い国民が高密度な形式の住宅を許容するようになっていることなどが指摘できる。しかし、都市基盤の整備が未整備な郊外地域における既存都市地域内あるいはその隣接地でインフィル型の住宅開発が続くと、不規則な形状の土地分割や接道の困難な土地が生じることが懸念されることが確認できた。

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