การศึกษาพัฒนาการขององค์ประกอบเชิงกายภาพของโครงการหมู่บ้านจัดสรรในกรุงเทพมหานคร

Chronological Study of Physical Elements of Housing Estate Development Project in Bangkok Metropolitan Region

ศิวาพร กลิ่นมาลัย
Siwaporn Klinmalai

คณะสถาปัตยกรรมศาสตร์และการผังเมือง มหาวิทยาลัยธรรมศาสตร์ 12120
Faculty of Architecture and Planning, Thammasat University, Thailand
E-mail: siwaporn@ap.tu.ac.th

Received 12/2/2018 Accepted 18/10/2018

Abstract

This research focuses on physical modifications to housing real estate following a period of development in the Bangkok Metropolitan Region. The scope of this study encompassed project and dwelling unit scale and analysis of these physical modifications. The study was conducted in three phases; first, a chronological study of housing real estate development according to political, economic, and regulatory factors including the National Economic and Social development plan was performed. The housing real estate development timeline was divided into seven discrete periods from 1957 to 2015. In 1967, the government sector initiated the first housing development project by selling land and dwelling units that became a prototype of housing development for the private sector. The second phase entailed study area selection; areas were screened for average number of dwelling units per year and were selected for those with continued growth across periods. The district selected for physical modification study was the Prawet district, with 16 housing projects therein chosen for analysis. The third phase comprised of analysis the physical elements of the research study area. The study found that the location of new housing projects over this time has shifted from middle-Bangkok to more outer areas. The ratio between common and residential areas by project was approximately 30:70. Physical modifications to dwellings revealed four common types; roof extension, space extension, side extension, or extensions for other purposes. A steady increase in unit width was revealed as well. In conclusion, housing developments have been modified by residents according to their daily needs. Developers should take note of these changes to support a better quality of life for residents in the future.

Keywords
Housing Estate Development Project
Chronological Study
Physical Transformation

บทคัดย่อ

บทความวิจัยนี้จึงมุ่งเน้นการศึกษาการเปลี่ยนแปลงเชิงกายภาพของโครงการหมู่บ้านจัดสรรเชื่อมโยงกับพัฒนาการของโครงการที่อยู่อาศัยในรูปแบบของลำดับช่วงเวลา ซึ่งการวิเคราะห์การเปลี่ยนแปลงในระดับโครงการและระดับหน่วยพักอาศัย ซึ่งกระบวนการวิจัยนั้นถูกแบ่งออกเป็น 3 ส่วน ได้แก่ (1) การแบ่งช่วงเวลาในการพัฒนาโครงการหมู่บ้านจัดสรรจากปัจจัยที่เกี่ยวข้อง ได้แก่ ปัจจัยด้านการเมือง เศรษฐกิจ กฎหมายที่เกี่ยวข้อง และแผนพัฒนาเศรษฐกิจและสังคมแห่งชาติ ด้วยวิธีการวิเคราะห์เชิงคุณภาพ พิจารณาในจุดที่เปลี่ยนแปลงของเหตุการณ์ซึ่งมีผลกระทบต่อปริมาณโครงการหมู่บ้านจัดสรรในตลาด จากการวิเคราะห์พบว่า ช่วงเวลาในการพัฒนาโครงการที่อยู่อาศัยโดยภาคเอกชนสามารถแบ่งออกเป็นทั้งสิ้น 7 ยุค ซึ่งในช่วงเริ่มต้นการพัฒนาหมู่บ้านจัดสรรเป็นไปในรูปแบบการค้าขายที่ดิน (พ.ศ. 2494 – 2499) ต่อมาได้โครงการหมู่บ้านจัดสรรได้เริ่มต้นจัดสรรที่ดินเปล่าสำหรับการสร้างบ้านในช่วงปี พ.ศ. 2500–2509 ภายหลังปี พ.ศ. 2510 รัฐบาลได้ริเริ่มการพัฒนาโครงการหมู่บ้านจัดสรรแบบบ้านพร้อมที่ดินขึ้นครั้งแรก ส่งผลให้ภาคเอกชนได้เริ่มนำไปพัฒนาตามในยุคที่ 3–4 (พ.ศ. 2510–2539) ปัจจัยที่มีอิทธิพลต่อการพัฒนามากที่สุดคือ ปัจจัยเชิงสังคมและเศรษฐกิจ เนื่องจากวิถีชีวิตของประชาชนมีการเปลี่ยนแปลงไปจากสังคมเกษตรกรรมทำให้เกิดความต้องการของที่อยู่อาศัยมากขึ้น ต่อมาในยุคที่ 5–7 (พ.ศ. 2540–2558) ปัจจัยด้านกฎหมายจัดสรรและสภาพเศรษฐกิจมีผลต่อการกำหนดขนาดของโครงการ ลักษณะหน่วยพักอาศัย และลักษณะสภาพแวดล้อมในโครงการ (2) การคัดเลือกพื้นที่ศึกษาและโครงการตัวอย่าง จากการคัดเลือกกรองด้วยจำนวนหน่วยพักอาศัยเฉลี่ยต่อปีที่มีการเติบโตต่อเนื่องในทุกช่วงเวลาของการพัฒนา อันได้แก่ เขตประเวศ ซึ่งมีการเติบโตของจำนวนโครงการหมู่บ้านจัดสรรสูงอย่างต่อเนื่อง (3) วิเคราะห์เปรียบเทียบรูปแบบการเปลี่ยนแปลงเชิงกายภาพ จากการสำรวจในพื้นที่ศึกษาในโครงการตัวอย่าง ซึ่งมีทั้งสิ้น 16 โครงการ จากผลการวิจัยพบว่าลักษณะทางกายภาพของโครงการมีการเปลี่ยนแปลงไป ในระดับโครงการหมู่บ้านจัดสรร พบว่า ทำเลที่ตั้งโครงการนั้นมีแนวโน้มขยายไปในพื้นที่กรุงเทพชั้นนอกมากขึ้น จากเดิมที่หนาแน่นบริเวณกรุงเทพชั้นกลาง สำหรับสัดส่วนของพื้นที่ส่วนกลางต่อพื้นที่พักอาศัยในแต่ละโครงการอยู่ที่ประมาณร้อยละ 30:70 ในระดับหน่วยพักอาศัย พบว่า การต่อเติมกายภาพมี 4 ลักษณะคือ การต่อเติมกันสาด ต่อเติมพื้นที่ ต่อเติมด้านข้าง และอื่น ๆ ซึ่งการต่อเติมกันสาดเป็นลักษณะที่พบมากที่สุด นอกจากนี้ยังพบการปรับเปลี่ยนพื้นที่ใช้สอยไปเป็นออฟฟิศหรือร้านค้ามากที่สุด ขนาดหน้ากว้างของหน่วยพักอาศัยมีแนวโน้มที่มากขึ้นแต่จำนวนหน่วยพักอาศัยในโครงการก็มีแนวโน้มที่มากขึ้นเช่นกัน ดังนั้น จึงสามารถสรุปได้ว่าการพัฒนาโครงการหมู่บ้านจัดสรรนั้นในอนาคตมีแนวโน้มที่จะขยายตัวออกจากกรุงเทพชั้นนอกออกไป การปรับเปลี่ยนกายภาพของหน่วยพักอาศัยมีแนวโน้มที่มีการปรับปรุงมากขึ้นตามอายุของโครงการ ผู้ประกอบการควรให้ความสนใจและเตรียมตัวในการพัฒนาโครงการหมู่บ้านจัดสรรทั้งในระดับโครงการและหน่วยพักอาศัย

คำสำคัญ
โครงการหมู่บ้านจัดสรร
การศึกษาเชิงพัฒนาการ
การเปลี่ยนแปลงเชิงกายภาพ

1. Introduction

This paper aims to understand the physical modification of housing real estate development in the Bangkok Metropolitan Region (BMR) according to a chronological study of the area and housing project selection. BMR's history of housing real estate development goes all the way back to 1957. Low-rise housing development has grown rapidly and seemingly haphazardly since then, without the benefit of careful planning. This type of growth in BMR has been defined as urban sprawl Galster, Royce, Wolman, Coleman & Freihage (2001), reflecting an uncontrolled urban development expansion process. Physical elements of these developments also affect quality of life, the environment, and the economy, and can be challenging to tease apart. These developments can also isolate local communities by fencing that obstructs the local road network and unsustainable project management (Klinmalai, 2014). Hence, an intense review of the transformation of the physical elements of housing real estate development is necessary to propose relevant solutions within the proper context.

2. Scope of study and methodology

2.1 Scope of study

A chronological study was performed for studying transformations over the development timeline to properly evaluate housing real estate development projects. BMR residential development by private developers first emerged in 1957, and this study, therefore, covers the period from 1957 to 2015, divided into sub-periods according to changes in political, social, or economic conditions, or regulatory policy. Of the 50 counties in BMR, the Prawet district was chosen as it is a primarily residential area with high numbers of residential projects and high growth. Analyses focused on project and residential unit scales, to include common area size, facilities, and management, and physical changes to unit elevation or functional components.

2.2 Research methodology

This study was conducted in two phases (Figure 1); first, an overall analysis of urban housing projects was conducted, and second, physical transformations to both project and units were explored in a single sample area.

For the first phase, a chronological analysis over the period from 1947 to 2015 revealed 1,136 gated housing projects. This phase aims to understand the overall situation and highlight certain factors significant to housing real estate development.

For the second phase, we focused on areas with continued growth in housing real estate development projects. We filtered our selection of study areas through statistical information relating to the number of housing projects (details in section 4). The area sustaining the highest level of growth, the Prawet administrative district, was selected for more in-depth analysis.

For the third phase, physical transformations at both the project and unit scale within housing developments were compiled from empirical observations of sample gated housing projects, and the impacts of these modifications were discussed.

3. Chronological development of housing projects in BMR

The study period was divided into seven discrete sub-periods (Saksrimaneekul, 2007) to explore chronological developments in housing real estate in BMR (Figure 2). Beginning in 1951, housing development was restricted to self-construction by inhabitants rather than organized communities (Horayangkura, 1993). In 1957, private housing developers started to allocate and divide the land into subgroups for sale. 1967 saw the first housing project constructed by the public sector that provided land, basic utilities, and dwelling units for rent or sale (Tiptus & Bongsadadt, 1983). This method became the prototype for future housing project development in both the public and private sectors in Bangkok. In

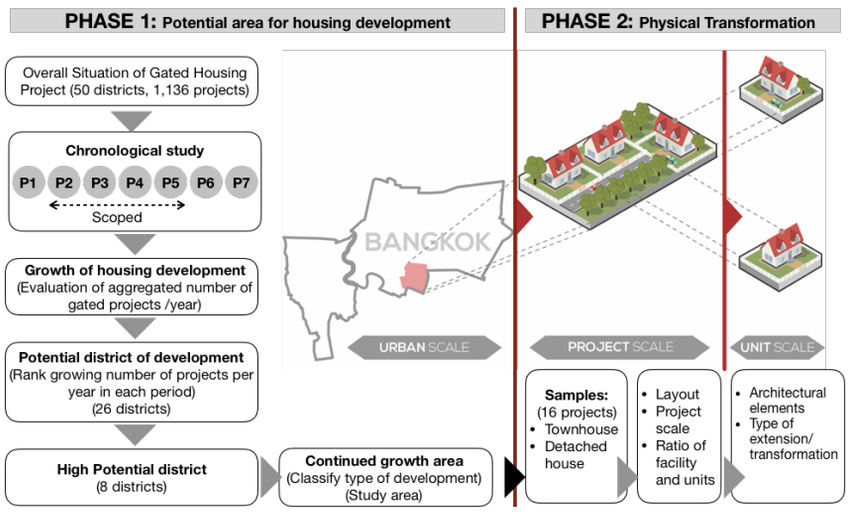
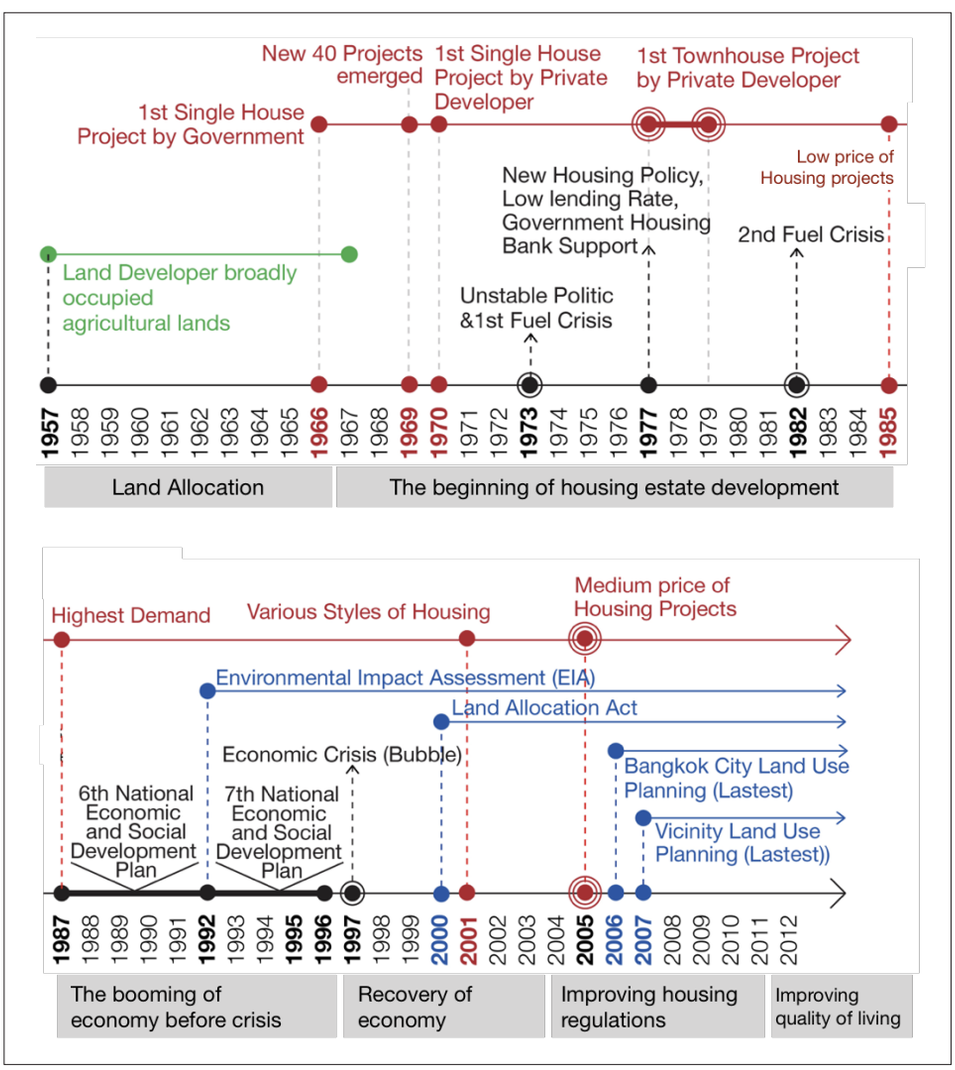


Figure 1. Research methodology



Source: Klinmalai & Kanki, 2013

Figure 2. Chronological study of Thai housing development

this study, we focus on the period of housing development from 1957 to the present. Sub-periods were chosen by socioeconomic factors, housing regulations, and housing market conditions.

3.1 Period I (1951-1956): Land development

The private sector has been a major player in the housing development market since 1951 when landowners began to trade and sell individual lots in the suburban areas of Bangkok. As land prices increased, these landowners segmented lands into smaller plots to generate more income. In this economic climate, buyers found themselves unable to build their own homes. Developers took advantage of this business opportunity to start packaging plots and houses for sale as subdivisions, generating higher profit margins per square meter. This development marked the beginning of housing real estate project development in BMR (Figure 2).

3.2 Period II (1957-1966): Land allocation

During this period, Thailand was undergoing an industrial development era as reflected in the first National Economic and Social Development Plan, which led to rapid population growth and high demand for residences. Private developers included in land plots standard infrastructures such as electrical grids, water supply, lighting, and streets for their projects. Meanwhile, the government stepped in to provide financial support for those interested in purchasing houses, enhancing this rapid development (Figure 2).

3.3 Period III (1967-1986): The beginning of housing estate development

The beginning of vertical housing real estate development was undertaken in the North and Northeast regions of Bangkok by the public sector in 1967 in response to inadequate housing to meet the needs of a quickly expanding population (Figure 2). In 1970, the private sector developed the first 40-unit housing projects with financial support from the government. This method went on to typify modern housing development in Bangkok for the next several years. Low-rise residential developments underwent a boom between 1976 and 1979 following an economic crisis with encouragement from government agencies. As residential construction costs continued to increase, private developers reduced the scale of their housing projects and residential unit models to support and increase profitability. The first vertical (high rise) condominium-style living projects were developed to increase profit margins on shrinking plots of increasingly expensive land. Architectural styles changed as well, to classical architecture, to represent a luxury image to entice buyers into this different style of unit.

3.4 Period IV (1987-1996): The booming of economy before crisis

Significant investment by the government into social and economic developments was launched through the 6th and 7th National Economic and Social Development Plans (1987-1996) (Figure 2). These plans aimed to spread urbanization outside the immediate vicinity of Bangkok by expanding infrastructure to these areas. Competition in the housing market spiked as a result. Environmental regulations for real estate and Environmental Impact Assessment (EIA) also came into play, evaluating large-scale residential or commercial projects (over 500 plots or total area is over 16 hectares) that now needed EIA approval before starting construction.

3.5 Period V (1997-2003): Recovery of economy

Following the economic crisis in Thailand, the government invested heavily in mass transportation inside the city, to include elevated light rail and subway lines. These improvements encouraged the public and private sectors to invest in future projects that would usher in an economic recovery (Figure 2). In 1999, the first elevated rail line was opened which placed upward pressure on housing real estate developments and land prices. Policies and regulations relating to housing development were modified to

suit the changing infrastructure and economic conditions. The Land Allocation Act of 2000 provided for common areas and standard infrastructure inside housing projects and mandated the establishment of a juristic committee to manage and maintain the common areas and infrastructure for each housing project. The following year, the proportion of green area necessary for a given housing project was set to at least 5% of the project area.

3.6 Period VI (2004-2011): Improving housing regulations

By the beginning of the twenty-first century, existing housing regulations had become obsolete, necessitating an update to the Bangkok Comprehensive Urban Plan that had been in place since 1999 (Figure 2). Improvements included setting the minimum size for plots for detached homes to 400 square meters each. This regulation had a significant impact on urban density in Bangkok.

3.7 Period VII (2012 - present): Improving quality of living

In 2012, the Environmental Impact Assessment (EIA) added that a housing project of over 500 plots required EIA approval before the developer could apply for a construction permit. The Bangkok comprehensive urban plan that was applied in the previous period was updated for 2013, allowing the minimum size of land plots for a detached house to be reduced to 200 square meters in certain residential areas. This regulation had an expected impact on the density of housing units and the environmental quality of living within these housing projects.

4. Continued growth in housing real estate development projects

To classify housing development areas with high growth potential, we analysed the aggregated number of gated projects per year in each area. Statistic sources limited our data collection to Periods II through V. A three-step screening process was employed to select a study area with continued housing development growth potential, described below (Figure 3);

1) Step 1: We evaluated the total number of new projects per year for each sub-period referenced above, and for all 50 districts in BMR. These were divided into groups by average project number as follows: “High” referred to ranking in the top 5, “Medium” was the next level down to the average, “Low” was below average, and “Very low” included those at the bottom of the rankings.

2) Step 2: We then culled all the “Very low” developments from the sample, leaving us with twenty-six districts. These districts were then ranked into four potential development categories; “High” indicated the district ranked as low to peak development for all periods; “Medium” referred to districts with at least two continuous peak development periods and one very low development period; “Low” indicated districts with only a single low to peak development period; and “Very low” referred to districts with below-average development during all periods.

3) Finally, we culled all districts outside the “High” development category, leaving us with eight districts. These were further classified into three types of housing project growth continuity; early growth, continuous growth, and uneven (discontinuous) growth. The Prawet district was selected for research due to its continued growth parameters, as it could best represent the preparedness of residential areas for future development (Figure 3).

We found that the middle and outer areas of Northeast BMR had undergone steady growth over the analysed periods with regards to total number of new projects per year. The western and southern portions of BMR (Thonburi) reflected low and very low development potential. This finding implies that the trend of housing real estate development is expanding outward to suburban and exurban areas of BMR.

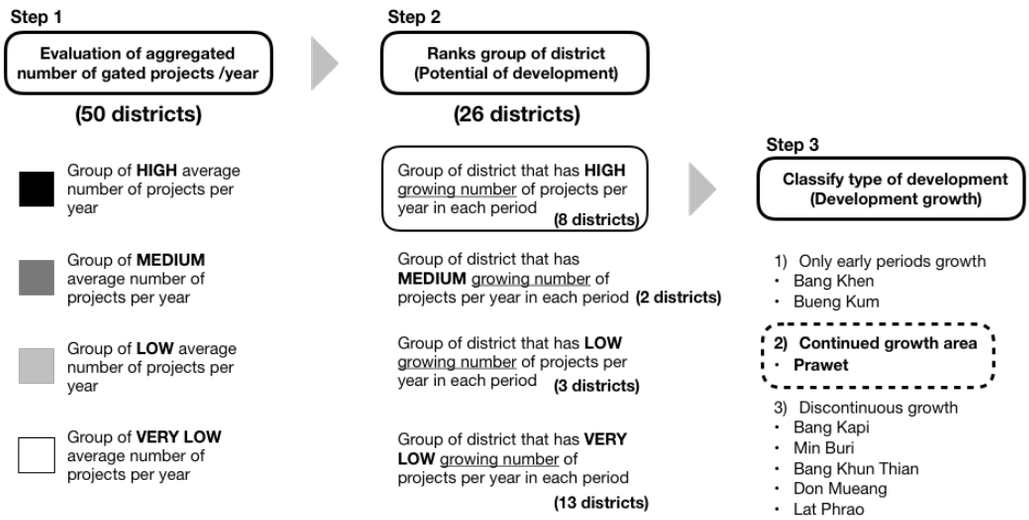


Figure 3. Process of screening Continued growth area of housing estate development project development

Among the high potential districts, the Prawet district has undergone continuous gated housing project growth from Periods II to V. Samples from the Prawet district were selected to analyse the transformation of physical elements to housing developments and individual units. Sample selection indicators were: type of residential unit (detached homes and townhomes), unit price (< 3.0 MB (lower class) and 3.0 – 15.0 MB (middle class)), and number of units per capita. Samples were also chosen to be representative of growth patterns over the study periods, as shown in Figure 4 and Table 2.

5. Physical element modifications

Changes to the physical elements of the housing developments were collected empirically via site survey and the filling out of a standard observation form. Data were recorded using photography and illustrations of physical element modifications at both the unit and project scales. Figures 5 and 6 show examples of physical element data that were analysed in this phase. Using illustrations, photographs, and architectural drawings were applied to present project layout, environment in a project, and number of unit type.

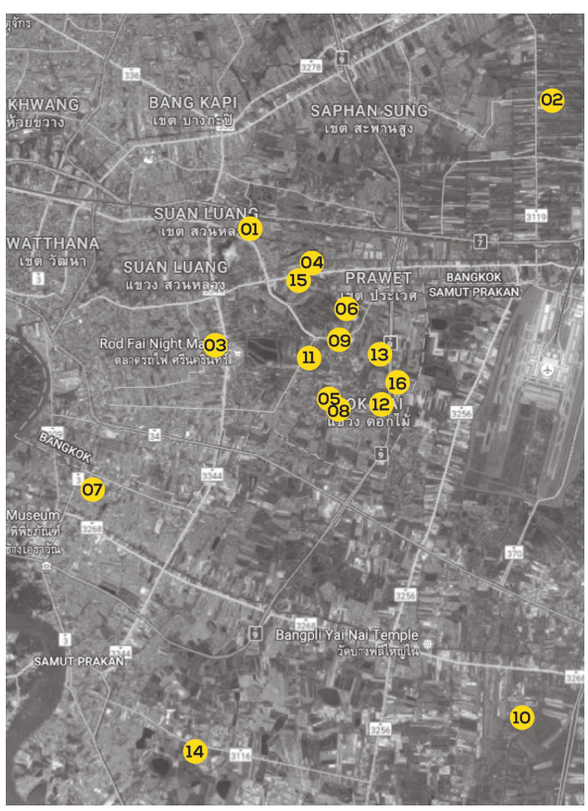


Figure 4. The Locations of the research sample

5.1 Key factors influencing physical transformation

In earlier periods, social factors and the National Economic and Social Development plan were the strongest effectors of demand, marketing, and investment in gated project development. The factors with the most influence on physical transformations at the project level were land allocation regulations;

Table 1. Classification of districts by group of average number of projects per year into four levels of potential development

Step 2							Step 3
Levels of potential	**No.**	**District (Location in BMR)**	**Step1: Average number (projects/year)**				**Type of Development**
			Period II	**Period III**	**Period IV**	**Period V**	
High Potential	1	Bang Khen (middle)	5.4	9.0	2.7	1.0	Type 1
	2	Bang Kapi (middle)	3.1	6.5	2.1	0.5	Type 3
	3	Min Buri (outer)	4.9	5.5	2.9	1.3	Type 3
	4	Bang Khun Thian (outer)	3.1	3.0	1.4	2.5	Type 3
	5	Bueng Kum (middle)	4.3	7.0	2.3	1.3	Type 1
	6	Prawet (middle)	2.9	6.0	4.3	2.5	Type 2
	7	Don Mueang (outer)	3.0	3.0	2.3	2.0	Type 3
	8	Lat Phrao (middle)	2.6	4.0	2.1	0.8	Type 3
Medium Potential	1	Saimai (middle)	1.6	7.0	3.1	1.0	
	2	Khlong Sam Wa (outer)	3.1	1.5	3.7	2.5	
Low Potential	1	Lat Krabang (outer)	3.0	1.0	1.9	2.3	
	2	Bang Khae (middle)	3.3	1.5	1.7	1.3	
	3	WangThonglang(middle)	3.4	2.0	0.9	0.5	
Very Low Potential	1	Phra Khanong (middle)	2.1	1.0	0.3	0.5	
	2	Taling Chan (outer)	3.1	5.5	0.7	0.5	
	3	Phasi Charoen (middle)	0.7	3.5	0.7	0.5	
	4	Nong Khaem (outer)	2.6	1.5	1.0	0.3	
	5	Rat Burana (middle)	0.0	0.0	0.3	0.5	
	6	Suan Luang (middle)	0.9	1	0.7	0.5	
	7	Chom Thong (middle)	0.9	0.5	1.1	0.8	
	8	Khan Na Yao (middle)	3.1	0.5	1.0	1.0	
	9	Saphan Sung (middle)	1.1	2	1.7	0.8	
	10	Bang Na (middle)	2.7	0	0.4	0.0	
	11	Thawi Watthana (outer)	2.6	2.5	2.4	0.3	
	12	Thung Khru (middle)	1.4	1	0.7	0.8	
	13	Bang Bon (outer)	2.9	1.5	0.7	0.5	

Note: 1) Meaning of colored cells in table was represented by grouping of project number per year

Black	Peak development = Value is in top 5 ranking of each period
Dark grey	Medium development = Value is below the peak group of each period
Light grey	Low development = Value is below the moderate group of each period
White	Hardly development = Value is below the low group of each period

2) Level of potential area was classified by continuity of development

High potential = District has only "low – peak development" but no "hardly development" in any period

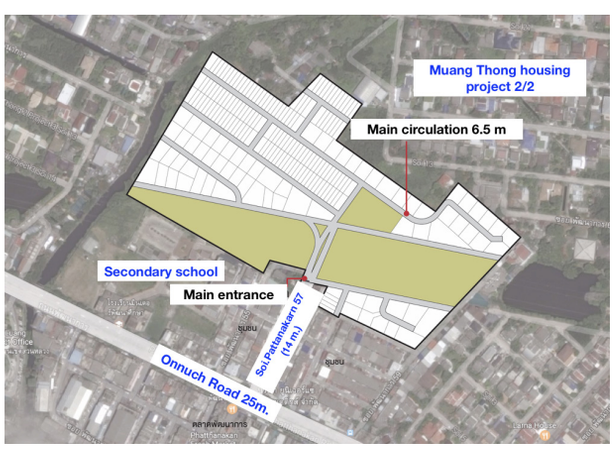
Medium potential = District has 2 continuous peak development periods and only one hardly development

Low potential = District has only one peak development period

Very Low potential = District has only "hardly – middle development" period

Table 2. List of the housing estate development projects as samples of the study

Period	Building type	Price	Construction Year	Project No.
2	Detached house	middle	1993	01
		Low	1993	02
	Townhouse	middle	1992	03
		Low	1989	04
3	Detached house	middle	2003	05
		Low	2002	06
	Townhouse	middle	2003	07
		Low	2003	08
4	Detached house	middle	2004	09
		Low	2005	10
	Townhouse	middle	2007	11
		Low	2010	12
5	Detached house	middle	2014	13
		Low	2012	14
	Townhouse	middle	2013	15
		Low	2013	16



(a) Project Layout

(b) Environment in project

(c) Number of Unit type

Figure 5. Physical elements in project scale

Table 3. Key factors influencing physical transformation

Period	Key Factors				
	Social and Economic	**The Land Development Act**	**Town Planning Act**	**National Economic and Social Development Plan**	**Environmental Impact Assessment**
II (1957-1966): Land allocation	Business Investment Marketing,	Physical (land allocation)	Physical (Tendency of housing location)	(Low impact)	(Low impact)
III (1967-1986): The beginning of housing estate development	Housing Market	(Low impact)	(Low impact)	-Marketing -Investment -Customer behavior	(Low impact)
IV (1987-1996): The booming of economy before crisis	(Low impact)	Physical (land allocation)	(Low impact)	-Overall economic -Marketing -Investment -Customer behavior	(Low impact)
V (1997-2003): Recovery of economy	Customer behavior	Physical (land size)	(Low impact)	-Marketing -Investment -Customer behavior	(Low impact)
VI (2004-2011): Improving housing regulations	Customer behavior, Purchasing power	Physical (housing location moving to urban fringe)	(Low impact)	(Low impact)	EIA is required
VII (2012-2015): Improving quality of living	(Low impact)	Physical (Common area attribution)	(Low impact)	(Low impact)	(Low impact)

Figure 6. Architectural elevation of housing units

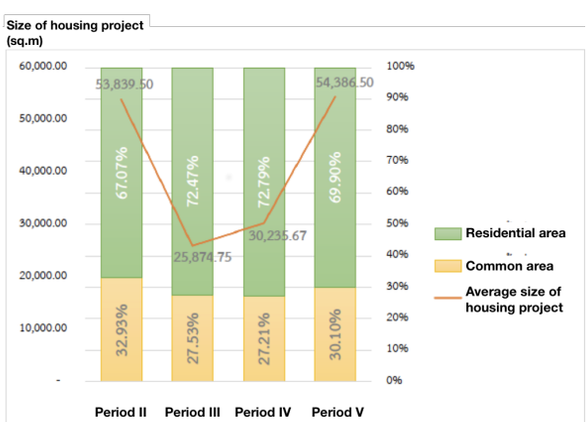


Figure 7. Ratio of common area in housing estate development project

such regulations strongly determined scale, location, and quality of the common areas in housing projects.

5.2 Housing project scale

Trends regarding common areas in housing projects since Period II are shown in Figure 7. Data revealed the average ratio between common and residential areas to be 30:70. Total project size underwent fluctuations depending largely on economic conditions; Periods III and IV showed an overall decrease due to high residential real estate demand. Developers were able, with little oversight from regulators, to divide land plots into increasingly small entities to maximize profits. After the economic crisis towards the end of Period IV, the minimum land size for one unit was defined by the Land Development Act to be 200 square meters. Customer purchasing power also increased during this time.

5.3 Residential unit scale

We found four overall types of physical transformations to individual units (Figure 8); roof

extensions to increase sunlight protection, increases (additions) to living area on the second and third floors, side additions to increase ground floor area, and extensions for other purposes. According to period, the roof extensions were seen across all time frames (Figure 9), whereas space extensions, first appearing in Period II, tended to depend on the age of the owner.

Figure 8. Physical transformation on elevation of unit

With regards to specific types of physical elements, gables and decorative columns on the front of the unit were liberally added during Periods II through IV. From Period V onward, modifications tended towards modernization, to include hipped roofs, reduction in decorations, and instalments of wider windows, as shown in Table 4. Sizes of units are given with regards to unit width (Figure 10). Townhouse unit width did not significantly change over the study period, (average 5.10 meters), but detached house widths grew from 6 to 10 meters. When we analysed associations between the unit width (Figure 9) and development size (Figure 7), we found a lower density of housing units per capita in projects developed in Periods III and IV than in Periods II and V.

6. Conclusion

Physical adaptations to housing real estate development have emerged according to lifestyle and socio-economic changes. The location of future developments has been driven by urban planning and infrastructure development from the public sector. Housing project building is expanding outward as land prices increase and regulations set limitations for housing density. Physical adaptations to projects and units have also changed over time, and factors therein include the type of development, zoning parameters, and project managers. In summary, the gated housing project has come to represent typical modern living in BMR and has encouraged its negative social and environmental consequences. All these factors must be taken into account when designing future projects that enhance the quality of life for their inhabitants.

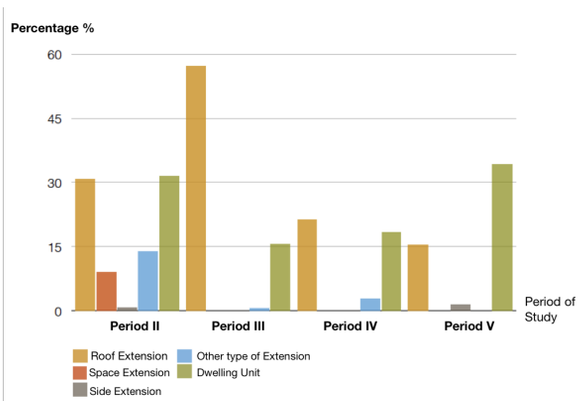


Figure 9. Physical transformation on elevation of unit

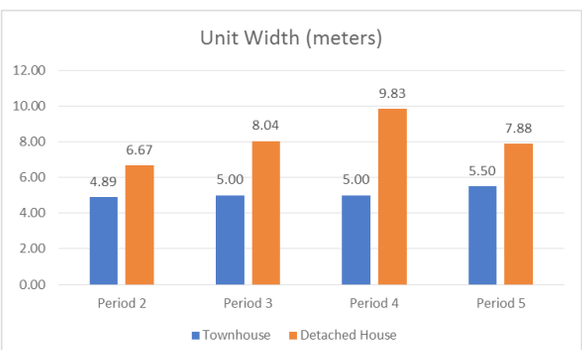


Figure 10. Tendency of housing unit width

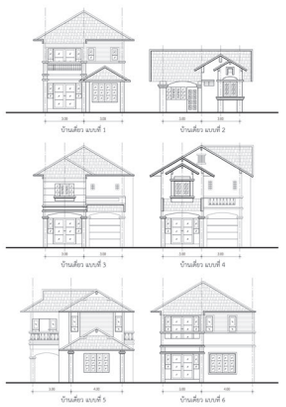
7. Acknowledgement

This paper is a part of research topic; A Study of Physical Transformations in Gated Housing Projects in Suburban Residential Areas of the Bangkok Metropolitan Region. It was subsidized by the Research Fund (General research) of the Research Administration Division of Thammasat University in 2015.

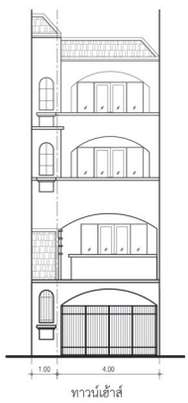
Table 4. Comparison of physical elements in housing unit by period of study

Period II (1957-1966): Land allocation

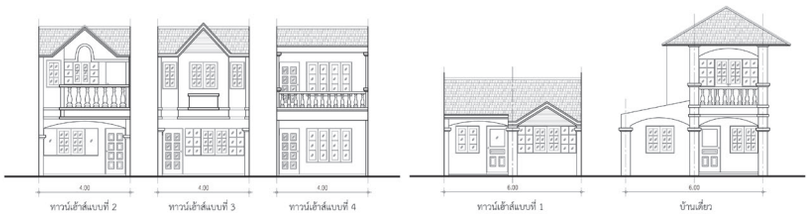
Project No.01



Project No.02



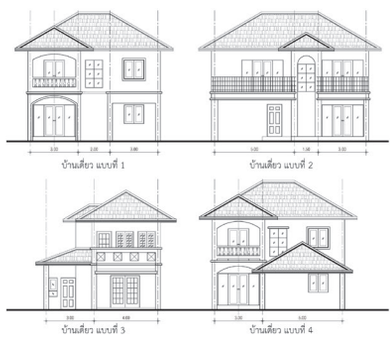
Project No.03



Project No.04

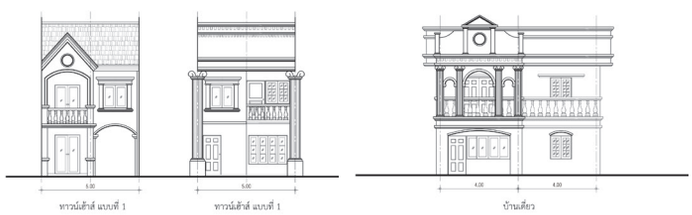
Period III (1967-1986): The beginning of housing estate development

Project No.05



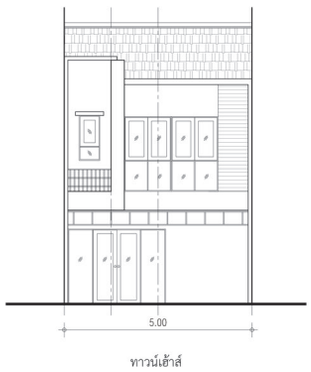
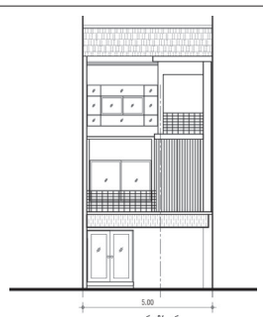
Project No.06

Project No.07



Project No.08

Table 4. Comparison of physical elements in housing unit by period of study (continue)

Period IV (1987-1996): The booming of economy before crisis		
		
Project No.09	Project No.10	Project No.11
Period V(1997-2003): Recovery of economy		
		
Project No.12	Project No.13	Project No.14
		
Project No.15	Project No.16	

References

Galster, G., Royce, H., Wolman, H., Coleman, S., and Freihage, J. (2001). Wrestling sprawl to the ground: defining and measuring an elusive concept. *Housing Policy Debate*, 681-717.

Horayangkura, V. (1993). *Development of architectural concept and configuration: Past, present and future*. Bangkok: Association of Siamese Architects Nationals.

Klinmalai, S., & Kanki, K. (2013). Neighborhood relationship assessment between inside and outside gated housing projects in sprawl area of Bangkok Metropolitan Region - The Case of Pathumthani Province where the different Gated Housing projects and Farmer villages are located adjacently. *Journal of the city planning institute of Japan*, *48*, 279 - 284.

Klinmalai, S. (2014). *Effect evaluation of gated housing projects accumulated in suburban residential areas of Bangkok Metropolitan Region.* (Doctoral dissertation). Kyoto University, Japan.

Saksrimaneekul, K. (2007). *Development estate juristic entity and legal consequences after the registration of the establishment.* Bangkok: Dhurakij Pundit University.

Tiptus, P., & Bongsadadt, M. (1983). *Houses in Bangkok: Style and transformation in 200 years (1782 - 1982)*. Bangkok: Faculty of Architecture, Chulalongkorn University.